cycles

—A MONTHLY REPORT

November 1953

FOUNDATION FOR THE STUDY OF CYCLES
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CONTENTS

Page

THE DIRECTOR'S LETTER 291

RESEARCH

Manufacturing Production (Physical Production—1810—1953) . . . .
 Part I—Trend 296
 Part II—The 54-Year Cycle 300
 Part III—The 11.2-Year Cycle 302

HOW IT CAME OUT

The 6-Year Cycle in Proctor and Gamble Sales 307

FOUNDATION AFFAIRS

The Scientific Program 309

QUESTIONS AND ANSWERS 311

LETTERS 312

ADDITIONS TO THE LIBRARY 314

SUPPLEMENT

Chapter VI, from *Cycles, The Science of Prediction,* a book by Edward R. Dewey and E. F. Dakin, and the 1953 Postscript 315

GLOSSARY 327

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cycles
—a monthly report

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VOLUME IV NUMBER 9 NOVEMBER 1953

The Director's Letter

Dear Member:

General Charles G. Dawes once said to me, "It isn't the little set-backs that bother the banker and the businessman. It is the big depressions which pretty nearly wipe him out that he needs to be forewarned of. If you can tell us when to expect these, the information would be the finest thing in the world."

He went on to say, as I told you once before, that if I would institute a service that would attempt to give this information (at a cost not to exceed $250 a year) his bank would subscribe, and that he personally would write letters to all the banks in the midwest, urging them to subscribe also.

I could have used the money, but at that time (1949) I did not feel that I knew enough. I do not know enough yet, but I think the time has come to use what knowledge we have about cycles to *try* to answer General Dawes's question and to give you as much information as possible about the next depression. When will it start? How bad will it be? When will it end?

The Next Depression

Depressions are times of severe and protracted economic dislocation. Factory chimneys are smokeless. Physical production is low. Business failures are numerous. Unemployment is high. Bread lines are long. Misery is widespread. People are dejected, dispirited, discouraged, disheartened—depressed.

Whether people are depressed because of the business set-back, or whether the business set-back occurs because people in the mass are depressed and lack their usual forward drive, no one yet knows. But for what it may be worth, my own conjecture is that the business set-back occurs because people are depressed—not the other way around.

Indexes of Depression

Unfortunately, there is no single measure of depressions. In the absence of any one index, a forecast of depression must rest upon forecasts of the individual phenomena involved.

The problem is complicated because the various individual measures mentioned above, and other measures such as the price of stocks, do not always go up and down together. For example, the panic of 1873 was followed by a drastic falling off of physical production and by a major depression, but the price of common stocks remained well above trend for more than three years. Conversely, the important decline in stock prices in 1940, 1941, and 1942 came at a time when physical production was increasing with unusual vigor. Each sort of behavior must therefore be forecast separately and blended afterwards as well as may be to form a composite picture of the whole.

With these facts in mind, I plan to investigate cycles in our major economic indices to see what light will come from this method of approach.

Stock Market Forecast Suggests Decline

First of all, the stock market forecast which I made in 1944 and which has worked out pretty well (see summary later in this letter) suggests declining stock market prices in the latter part of the present decade.

Stock market prices provide one glimpse of what may lie ahead. I shall therefore revise this forecast for you as soon as possible.

Supported by Failure Study

Second, the study of cycles in commercial failures, which I printed for you last month, more or less reinforces the earlier stock market study. Increasing bankruptcy liabilities go more or less naturally with declining stock market prices.

Physical Output Study

Third, I am now making for you a study of cycles in the physical output of manufacturing plants 1810-1953. It is too soon to say what this study is going to show, but I hope to have the answer for you in time to include it in the December report, or at the latest, in our report for January 1954.

Mineral Output Study

Fourth, the study of cycles in mineral production which I plan to make thereafter should throw additional light on our problem. What could be more indicative of real prosperity and depression than the production of bituminous coal?

Eventually, like the group of blind men feeling the elephant, we should have a pretty good composite picture. It should give us the main outline of the future, insofar as it is going to be influenced by cyclic forces.

What People Expect

Of course this is not enough for some people. They expect (for $10!) to be told just what business is going to do, just what prices are going to do, and just what the stock market is going to do. Well, perhaps not *just* what it is going to do, but close enough to what it is going to do so that they can double their money every year! I trust we have no such wishful and unrealistic thinkers among our membership. If we do, they had better resign and spend their money on gypsy tea-leaf readers. At least they will get a cup of tea out of it.

The Glowworm

But for the rest of us, even a little light is so much better than anything we have *ever* had before that we are very happy at the progress being made. A firefly may not light things like the sun, but if you are in complete darkness, even a firefly or two can keep you from bumping your nose. I have used a firefly even to read the face of a watch. Perhaps *Shine Little Glowworm* should be the theme song of the Foundation.

Complete Darkness

You may question my phrase "complete darkness." Listen:

"Economists have not yet evolved, if they ever will, a technique for making dependable forecasts"—Arthur F. Burns of Columbia University, the National Bureau of Economic Research, and the President's Council of Economic Advisors.

"It cannot be too strongly emphasized that there is nothing in economic science which enables us to foretell events... There is nothing in history to suggest that the expected will normally happen... Economic prediction as a scientific method is...absurb, because impossible..."—John Jewkes, Professor of Social Economics at Manchester University, England.

These statements are made by great leaders, and are true, within the framework of economic science. It is only when we ignore economics and address ourselves to the study of cycles that we get a glimmer of success.

Economists in a Maze

The economist has much in common with a rat in one of these modern electrically controlled mazes used for experiment in the psychological laboratories.

In his way, the rat is a scientist—a maze scientist, if you will.

The rat is hungry. He goes to the left. He gets an electric shock. He goes to the right. A door opens and he gets food.

He is hungry again. "Aha!" he says, "I have this thing worked out. Ours is an orderly universe. What has happened before is likely to happen again. Last time when I went to the left I got my whiskers burnt. When I went to the right I got food. Ergo, this time, I go to the right." So he goes to the right. He gets food. Science, it's wonderful!

The economist, like the rat, is also a scientist, but he does not have it as easy. He is in the situation the rat would be in if, having nicely learned that going right meant food, he should suddenly discover that going right meant burnt whiskers. It is *not*, feels the rat, an orderly universe after all. Somebody switched signals. The economist perhaps feels the same way.

The Answer Lies Outside the System

The rat and the economist have both failed, and for the same reason: They have sought the answers to their problem *within* the system in which they found themselves. For the rat the system is the maze, for the economist it is society. The rat never learned that outside the maze was an operator who switched the wires one way on Mondays, Wednesdays, and Fridays; the other way on Tuesdays, Thursdays, Saturdays, and Sundays. There *is* a pattern, but he never learned it. Only a few economists have yet learned that *outside* of society there seems to be an operator who switches the wires first one way and then the other in orderly rhythmic patterns which they must learn if they are to make successful forecasts. And, if you don't want your whiskers burnt, *you* must learn about these rhythmic factors too!

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WHAT'S AHEAD FOR STOCKS?

Yesterday morning (September 15th) one of our members telephoned me from New York to ask, "What is the stock market going to do?"

"I don't know," I answered. "If I did I could be rich."

"Oh yes, I know," he said. "You don't *know*, but what do you *think?*" Is this a good time to buy? I won't hold it against you if you are wrong."

I suppose he meant should he buy then and there, with the Dow Jones Industrials at 254.36, the low for the year up to present writing.

I was on a spot. If I refused to tell him anything, or if I straddled like a broker, I was depriving him of some help which he very obviously needed. On the other hand, if I told him what I *do* know, it was going to be hard to keep him from reading too much into it—buying if I sounded bullish, not buying if I sounded bearish.

Now honestly, I do *not* know when to buy or when to sell. If I did, as I told him, I could be very rich indeed.

Or, if I did not know quite enough for that, I could, like a man I know of in New York, sell such knowledge as I had for $5,000 a year per client, and have two or three dozen clients without trouble. I *don't* know when to buy or when to sell. I *don't* know $5,000 worth. But I do know a little something. Shall we say $10 worth?

I told this man the little something I do know, and then, to keep him from getting mixed up, I wrote him the following letter:

My Letter to Mr. B....

Dear Mr. B....:

Confirming and supplementing what I said to you over the telephone this morning:

First of all, for the last hundred years the major moves of the stock market have been dominated by a cycle which has averaged about 9.2 years long. I told you about this cycle in an article on pages 204—207 of our report for June 1951.

Although this cycle is 9.2 years long *on the average*, no one wave is exactly 9.2 years long. Some waves are longer; some are shorter.

The 9-Year Cycle Discovered in 1860

A 9-year cycle in economic affairs was first discovered in 1860. The fact that it has kept on coming true for the 90 years which have elapsed since its discovery makes it very unlikely that this behavior is the result of random or haphazard forces.

In stock prices, this cycle had its first crest in 1835. It has had twelve additional crests since that time. The last three crests came in 1929, 1937, and 1946.

The 9.2-year cycle in common stock prices is now on its way up. *Ideally* it is due for a crest in 1955.

Unfortunately, the ideal rarely happens. Other cycles and accidental factors generally combine to make the crest or trough of any particular wave come either early or late. More often than not, turning points of the actual prices have come within nine months of perfect timing, but on occasions, turning points have been as much as 2½ years one way or the other from the ideal. For example, the trough of the current cycle, due in 1951, came in 1949.

Will Current Crest Come Late or Early?

At the present time, the $64 question is, will the fourteenth crest of this cycle, due ideally to come in 1955, come on time, come early, or come late? And, if it is to come early or late, by how much will it vary from perfect timing?

There are many other cycles in the stock market ranging from a few days up to many years. If we knew enough about the other cycles, we could get some light on what the 9.2-year cycle will do in the present instance.

My Projection of 1944

Studies of the market through 1943, which I made back in 1944 for a large New York brokerage house, suggest at least nine other cycles 4½ years long or longer in these figures.

A combination of these cycles, which I made at that time and projected to 1990, suggests that the turning point of the current 9-year cycle will come *early*—1952, 1953, or 1954.

Actually the forecast of 1944 calls for the present bull market to crest in a double top 1952 and 1954, with a dip in between in 1953, *but I do not think you should place reliance on these little wiggles.* Shorter cycles which are not included in the synthesis, and random fluctuations, could easily modify the 1944 forecast importantly. If the forecast gives you the broad picture accurately I think that is all you can ask of it.

Just because now, for the first time in history, you hold a glowworm in your hand to help to light the future do not plunge boldly ahead as if you had a flashlight. What looks like a door by glowworm light may be a curtain—what looks like a curtain may be a door. Don't, in other words, bump your nose.

I think the work of 1944 was on the right track. Granted a good measure of beginner's luck, I do not think the forecast could have been as good as it was *entirely* as a matter of luck. Here is the record:

How It Came Out

The forecast said that the Standard & Poor's Corporation Combined Index would unfold as follows:

1944 would be higher than 1943. It was.
1945 would be higher than 1944. It was.
1946 would be higher than 1945. It was.
1947 would be lower than 1946. It was.
1948 would be lower than 1947. It was not. It was 1.1% higher.
1949 would be lower than 1948. It was.
1950 would be higher than 1949. It was.
1951 would be higher than 1950. It was.
1952 would be higher than 1951. It was.

Moreover, if you adjust to a gold basis, the percentage changes were about right, too.

On the other hand, do not forget that *many* of the ups and downs from 1854 to 1944 were *not* accounted for by the combination of the ten cycles. It is fantastic to suppose that a combination of cycles will work better in the future than it did in the past. The success of the forecast, therefore, *is* partly beginner's luck. Don't lean on it too heavily.

Can the forecast of 1944 be improved by including significant shorter cycles? Undoubtedly.

Mr. Hughey's Forecast

A Mr. Vedder Hughey of Coral Gables, Florida, has made such an attempt. He included a lot of shorter cycles. I reprinted some of his work for you in our reports of March, April, and May of 1953. Mr. Hughey's work, published by him in June of 1952, called for a buy at that time, and a rise to the second week of March 1953, which his work indicated would be the top of the bull market.

From a top in the second week of March (which turned out to be within three points of the top as it actually unfolded) Mr. Hughey's work called for a decline to mid-September, a rally for a couple of months, and then a continuation of the decline. Up to mid-September this forecast has worked out quite accurately. A buy in early June 1952 and a sell in the second week of March 1953 would have given you a profit of 21 points—a short sale in the second week of March 1953 covered at mid-September prices would have given you a profit of 35 points.

Do not be misled by this success. Mr. Hughey says his forecast is not good enough for a prudent man to follow. I say the same thing. *As yet cycle forecasts just cannot* consistently *pin-point things with this degree of accuracy.* Probably they never can. Maybe Mr. Hughey had a bit of beginner's luck, too.

Qualifications

And now I come to the hardest part of it. If a forecast has to be qualified by phrases such as "if the cycles continue," "if shorter cycles and random factors don't overwhelm it," "if lengths, strengths, and timing of all cycles have been determined correctly," "if we have found all important cycles,"—in short, if the forecast is not good enough for a prudent man to follow (slavishly), what good is it?

To help you to answer this question consider a medical analogy. Suppose you have a baffling ailment. The quack will tell you, "You have interioritis of the semicolon. Take blue pills every other hour and pink pills in between." Most people like a man like that. But the really good doctor will tell you, "I don't know what the matter is, but you are sick, and you'd better stay in bed and eat lightly."

This is a Time for Caution

In the same vein I say to you, I don't know what's ahead. But what little I do know about cycles suggests that we are near the top of the boom—that we may even have passed it—and that although purchases made at the present moment may turn out quite profitably, there is much less liklihood of their doing so than purchases made when the combination of cycles is as it was in 1949, let us say. Now is the time, if you buy at all, when you should buy very selectively. Now is the time when, if you do make money on an advance, you should be doubly careful not to overstay the market. Now, in other words, is the time to "to stay in bed and eat lightly."

Cordially yours,

Edward R. Dewey

Director

Research

MANUFACTURING PRODUCTION (PHYSICAL PRODUCTION—1810-1953)

Part I—Trend

Summary

Trend (the growth element) is the underlying tendency in a series of figures. Growth usually changes directions slowly. Things grow at a rapid rate at the start; at a less rapid rate later. Occasionally growth changes direction abruptly, as the oil industry did with the coming of the automobile, the copper industry with the coming of electricity. Such an abrupt change is called a rebirth. It is possible that the upsurge of manufacturing production which started in the 1930's is the first stage of such a rebirth, but after weighing all the evidence, I do not think so. We cannot tell for sure until after we experience the next depression and see how deep it goes. But for the present, unqualified optimism is premature.

THIS is Part I of a study of trend and cycles in manufacturing production in the United States. By manufacturing production we mean the output of manufacturing plants measured in physical units such as tons, barrels, board feet, etc, as distinct from output measured in dollars. Manufacturing production is a good measure of boom and depression.

The Index, 1810—1953

The Foundation's index of manufacturing production in the United States 1810-1953, charted on ratio scale, is shown on the following page in Fig. 1. It rises from a value of .23 in 1810 to a value of 250 at the present time—a truly phenominal increase for a 143 year period. It is probably not fruitful to prepare a year-by-year index of manufacturing production prior to 1863, but an index based on decennial figures can be constructed back to 1810.

War Distortions

Four war distortions are clearly evident. These have been adjusted for by broken straight lines connecting the last pre-war and the first post-war years. No one maintains that the straight lines represent what would have happened if there had been no war; they represent merely some values *closer* to what would have happened than the values which actually unfolded under war pressures.

What do we Mean by Trend?

What is the *trend* of manufacturing production?

Trend is the underlying or prevailing tendency of a series of figures. Ideally it represents a growth element by itself,

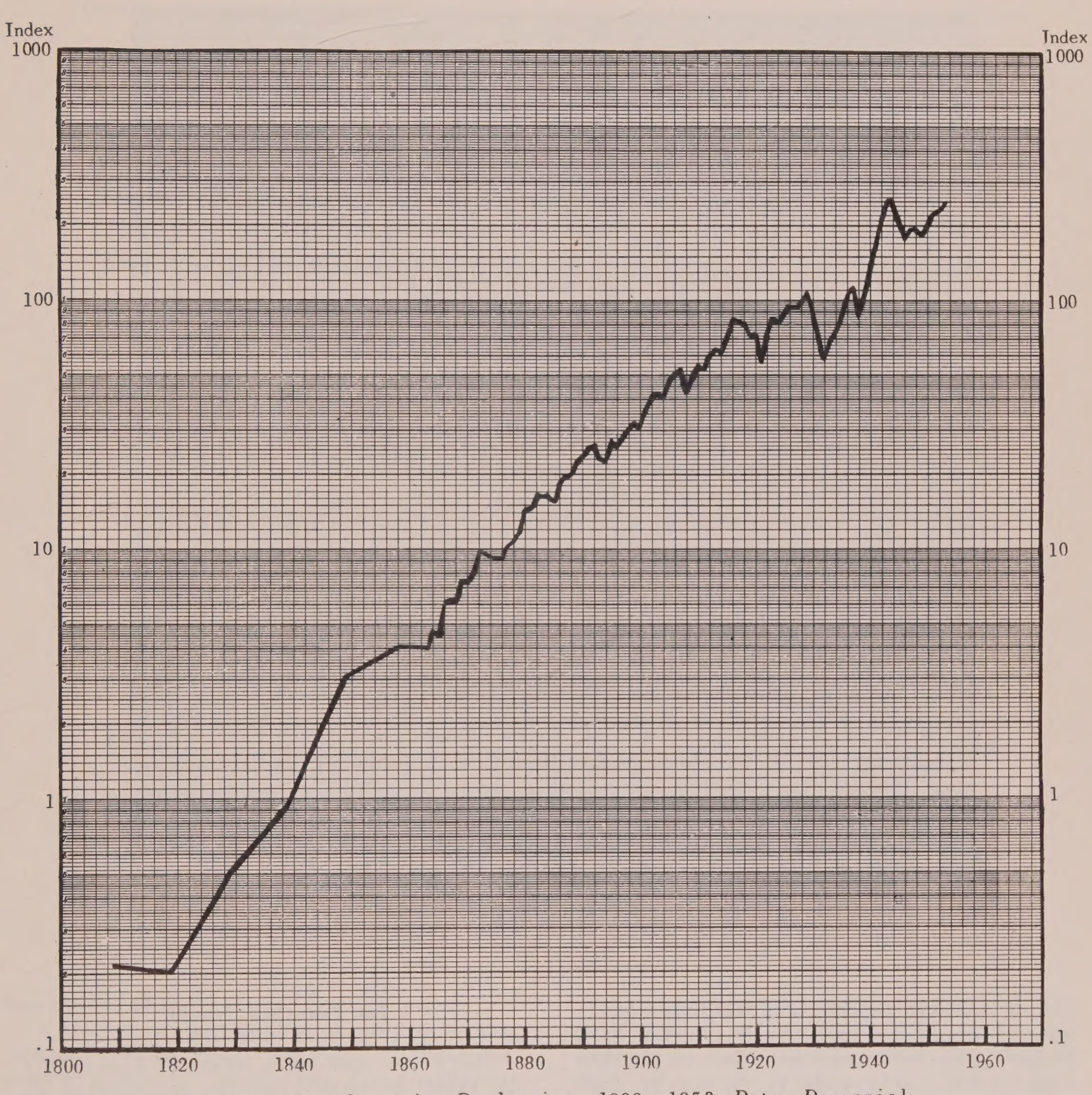


Fig. 1. Manufacturing Production, 1809—1953. Data, Decennial 1809—1859; Annual 1863 Forward. Value for 1953 is an Estimate. Ratio Scale.

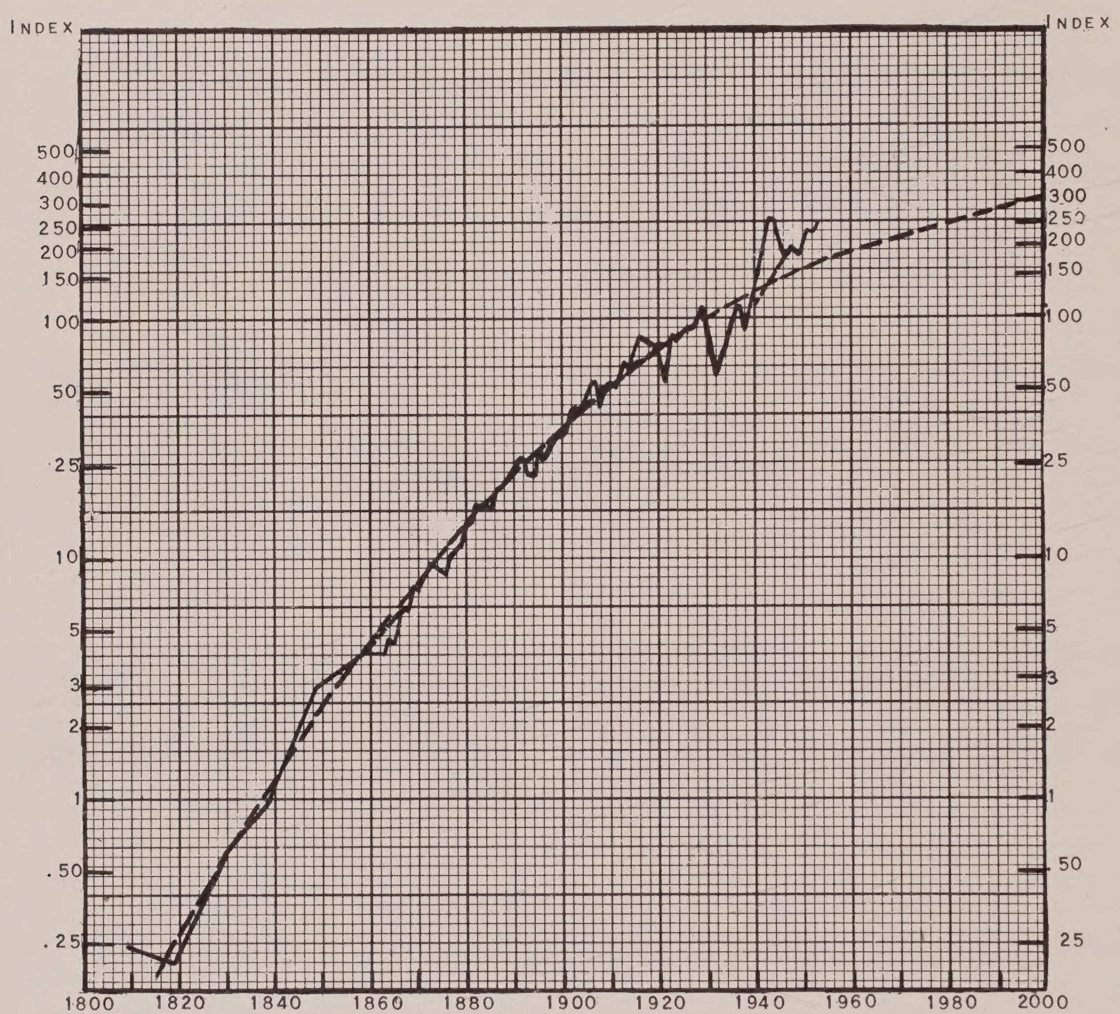


Fig. 2. Manufacturing Production, Together with a Simple Growth Trend.

all cycles and random fluctuations eliminated. Trend is usually pictured by a broken line; but remember this—the broken line is not the trend, it is merely some man's *idea* of the trend. For all the mathematical hocus-pocus involved in "determining" trend, there can be as many different trends as there are statisticians (some think this is too many). And when it comes to projections of trend, no one of them is worth a tinkers damn unless it happens to be the right one.

Two Possible Trends

There are two main ways of looking at the trend of manufacturing production in the United States.

First we can assume a smooth curve, concave downward, as in Fig. 2. If this is the truth we can expect future growth of manufacturing production to continue gently upward at a constantly decreasing rate of growth, until such time as complete maturity is achieved and the trend

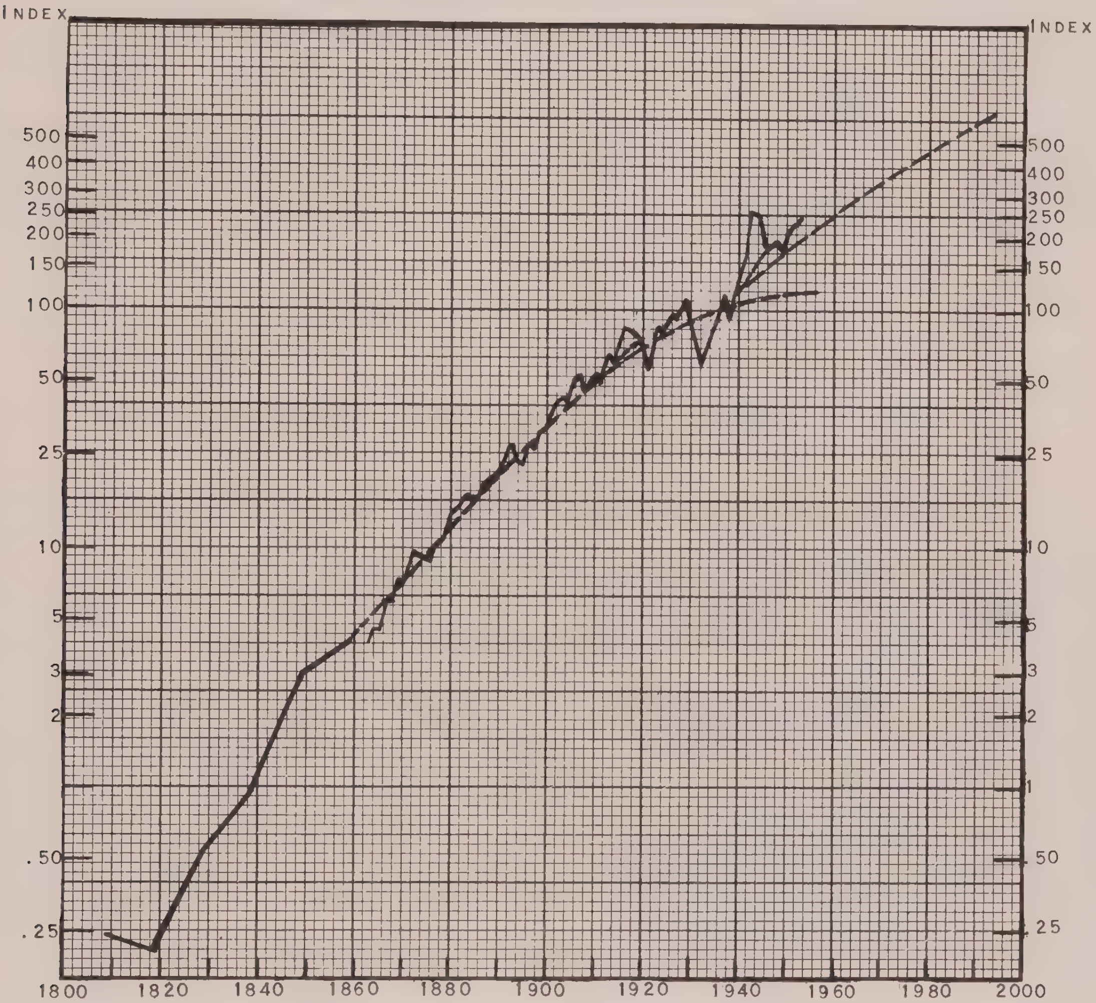


Fig. 3. Manufacturing Production, Together with a Compound Growth Trend.

has become flat.

A second way of looking at manufacturing production is shown by Fig. 3. Here we have a compound trend, the first segment of the trend being concave downward, through the 1930's, the second segment springing from it in a "rebirth" as it were in the late 1930's and now on an upsurge which on its part will flatten in time, but, at the rate it is now going, not for decades to come.

This concept of rebirth certainly does fit the facts—also it provides joy in the hearts of wishful thinkers, of whom there are many. New Dealers and other socialists will like it too, as it will seem to provide vindication for the governmental policies of the past twenty years. "We have had increasing socialism. We have forged ahead. All hail, the Welfare State!" (Eisenhower was elected. It rained. God praise Eisenhower.")

More seriously, as a compound growth curve does fit the facts, whatever the cause, it may be the true explanation of the tremendous upsurge from the levels of 1937-39. But, for what it may be worth, I do not think so.

Part of the upsurge can be explained by the long 54-year cycle, which has been in upward phase since about 1933. Part of it may have been due to war and to preparation for war. Part of it is due to shorter cycles already known. Part of it may be the result of other cycles as yet undiscovered. When our cycle study of these figures has been completed we can have a sounder basis for an opinion, but it may be impossible to *know* until we have experienced the trough of the next depression.

In either event growth is still strong enough to snub our descent into the next depression and to speed our recovery from it. But beyond this I think unqualified optimism for the future is premature.

Part II—The 54-Year Cycle

Summary

Study of available records for the past 150 years suggests that the present peak of industrial output is in part the result of the long 50- to 60-year cycle. This cycle is now in upward phase and is due to be so until about 1960. This fact should lessen any depression occuring during the next seven years.

From 1960 through 1987 industrial production will probably increase at a more moderate rate, the 54-year cycle declining.

Further studies will endeavor to refine the broad picture painted above, and to make a specific projection of this series of figures.

THE 54-year cycle in manufacturing production in the United States crests ideally at about 1798, 1852, 1906, 1960, 2014, etc. Troughs fall ideally mid-way between crests at about 1825, 1879, 1933, 1987, etc. (In wholesale prices this cycle has turning points which come ideally 19 years later.)

The 54-year cycle in manufacturing production has an amplitude (strength) at time of crest equal to about 6.4% of trend (and 6.0% below trend at time of trough). Fig. 4 shows, on ratio scale, (a) a diagram of this cycle, (b) the residual after its removal from the index of manufacturing production, and (c) a first approximation of the true underlying growth trend.

I do not expect the case for a 54-year cycle in these figures to seem very convincing. Our series is just not long enough, and the strength of the 54-year cycle is just not great enough to make a dramatic showing.

My opinion is based on an intensive study of manufacturing production from 1800 forward. Some day I shall report to you upon this cycle in various earlier series of figures, but for the present it will have to suffice merely to name them, as follows:

Series Studied

(a) Vessels built, in gross tons, from 1800.

(b) Manufactures of iron and steel exported, in dollars, adjusted for price, from 1800

(c) Lumber production, in board feet, from 1809 (the 1799 figure is not good).

(d) Pig iron production, in tons, from 1810.

(e) Exports of domestic copper and manufactures, in dollars adjusted for price, from 1810.

(f) Coal produced, in tons, from 1814.

(g) Export of manufactured goods, total, in dollars adjusted for price, from 1821.

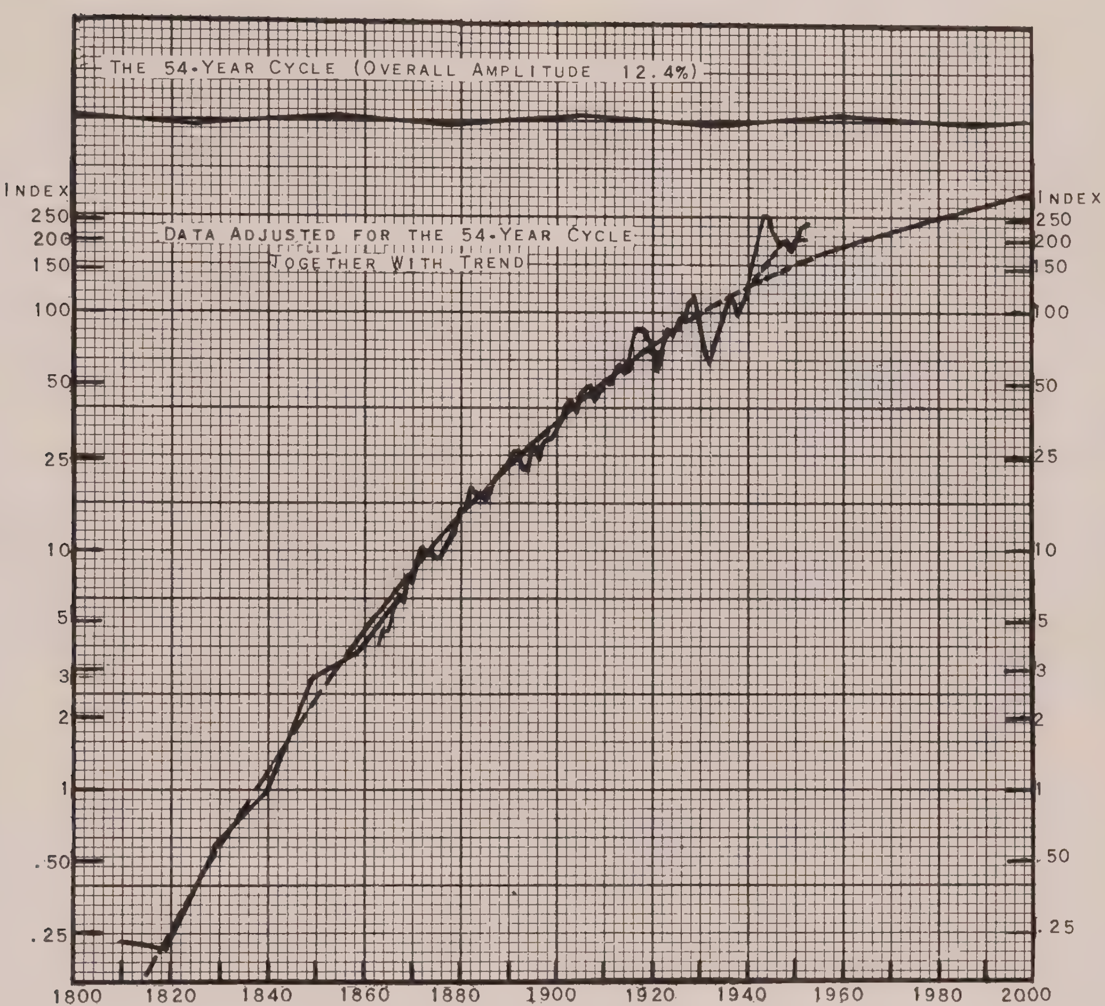


Fig. 4. Manufacturing Production—The 54-Year Cycle, the Data Adjusted for the 54-Year Cycle, and A First Approximation of Trend.

(h) Production of lead, in tons, from 1825.

(i) Cotton goods manufactured, in dollars adjusted for price, from 1839.

(j) Cotton consumed in manufacturing, in bales, from 1839.

(k) Copper produced, in tons, from 1845.

(l) Wage earners in manufacturing, from 1849.

Basically, the case for the 54-year cycle in industrial production rests upon its marked presence in some of the industrial production series studied, plus the fact that if you assume that such a cycle is present and adjust for it, the residual growth factor unfolds more smoothly—and this is the way growth usually expresses itself.

An Opinion

I am perfectly willing to admit that this concept of a smooth trend and a 54-year cycle is merely an opinion. Some-one who knows more than I do might make a better guess. Figures of physical production in this country simply do not go back far enough to permit enough repetitions of a 54-year cycle to prove its significance. There is no question but that there *is* a cycle of about this length in at least some of these figures, but is it there merely by happenstance? No one knows.

The case for the *significance* of this cycle in these figures rests upon two facts: (a) that in British wheat prices, and seemingly also in Arizona tree rings, a cycle of this length has been functioning for hundreds of years, and (b) that this cycle has continued to come true ever since it was originally discovered (by a Dr. Clarke) in 1847.

All this is pretty tenuous and, admittedly, adds up to little more than fancy guessing. But, in the complete darkness which otherwise surrounds us, even a glimmer of light may be welcome.

Broad Picture for the Future

In any event, it does not make too much difference for the next seven years or so. By whatever way you measure it, the underlying growth factor (or growth and 54-year cycle combined) should be strong enough to minimize any depression which we may have in the next few years, and to help us recover from it more rapidly than we otherwise would. The big difference will come between 1960 and 1987 when (if I am right) growth will slacken and depressions will be deeper and recovery will be more sluggish than would be the case if the 54-year cycle were in upward phase, as it clearly is at the present time.

More Detailed Picture to Follow

In other sections of this article I shall tell you about some of the shorter cycles present in these figures and what they suggest in regard to the exact timing, scope, and intensity of the depression which lies ahead. The shorter cycles, when determined, will also enable us to refine the trend projection, as you will see.

Part III—The 11.2-Year Cycle

IN addition to growth and a 54-year cycle, manufacturing production in the United States has been characterized by a rhythmic cycle which averages about 11.2 years long from crest to crest or trough to trough.

This cycle in these figures was first discovered by Dr. Carlos Garcia-Mata. It was reported upon by him and by Dr. Felix I. Shaffner in the *Quarterly Journal of Economics* for November 1934 in a paper called "Solar and Economic Relationships." This paper was reprinted by the Foundation for the Study of Cycles in 1945 as *Foundation Reprint No. 10*.

The interesting thing about this cycle is the fact that, insofar as we are able to see it through war distortions, this cycle is still continuing. This of course tends to substantiate its significance.

Crests in the 11.2-year cycle of industrial production come ideally about 1871.4 and every 11.2-years thereafter. This puts the last top ideally about 1949.8, the next top ideally about 1961.0.

Troughs fall ideally midway between crests. The current trough is due about 1955.4, but readers of these pages hardly need to be reminded that the ideal rarely happens.

Crests and troughs almost always come early or late. We need to know about the other cycles (and as much as we can about random fluctuations) before we are in a position to hazard a guess about the actual future course of industrial production in this country. A trough two years early would put the bottom of the current wave right now, completely wiped out by the Korean War and preparation for World War

III. A trough two or three years late would put the bottom in 1957 or 1958. Until I learn what is to be known about the other cycles, I have only the sketchiest idea of what may be ahead for this series of figures.

You can see the 11.2-year cycle by simple inspection of Fig. 1 of Part I of this report (from 1863, when the annual data start, forward). You can see it more clearly if we express the data as percentages of their 11-year moving average trend—after adjusting as well as may be for war distortion—and smooth the result by a seven year moving average to iron out the minor cycles and random fluctuations. This cycle is shown in Fig. 5.

Study of the 11.2-year cycle in manufacturing production shows that it has a typical strength of about 9.6% above trend at crest, about 8.8% below trend at trough.

Awhile back I mentioned the work of Dr. Garcia-Mata. As he is the man who discovered this cycle in industrial production, I think that, at this point, you might like to have a more complete account of his work.

Jevons' Theory

As you may know, back in 1878 an Englishman named Jevons, counting the crises between 1721 and 1867 found evidence of unbroken periodicity with an average length of 10.43 years. Using other starting points back to 1701 he found similar periods. He concluded that the typical length of the cycle of business crises was 10.44 years.

As he could "see no reason why the human mind, in its own spontaneous action, should select a period of just 10.44 years to vary in ..." and as he believed the sunspot cycle was 10.45 years long, he concluded that some outside phenomenon related to the sunspot cycle was timing the industrial waves so as to make them fall in line with the solar period. This outside phenomenon he believed to be crops. That is, sunspots affect crops, crops affect business. Simple!

It was a fine theory except for two things—(a) the sunspot cycle is not 10.45 years long and (b) crops do not have a 10.45 year cycle, or, as far as is yet known, any cycle anywhere near this length.

Sunspots come and go in an irregular cycle which runs from 8 to 15 years in length. Depending upon how you average these cycles—and with what years you start and stop—you can get average or typical lengths of anywhere from 10.08 to 11.4 years. The length most generally accepted at the present time is 11.15 years.

It is easy to see, once Dr. Garcia-Mata has investigated the matter for you, that there is no 10- or 11-year cycle in crops. Refer to his Chart I reproduced below. In his own words, "The absence of correlation between the cycles of the solar curve

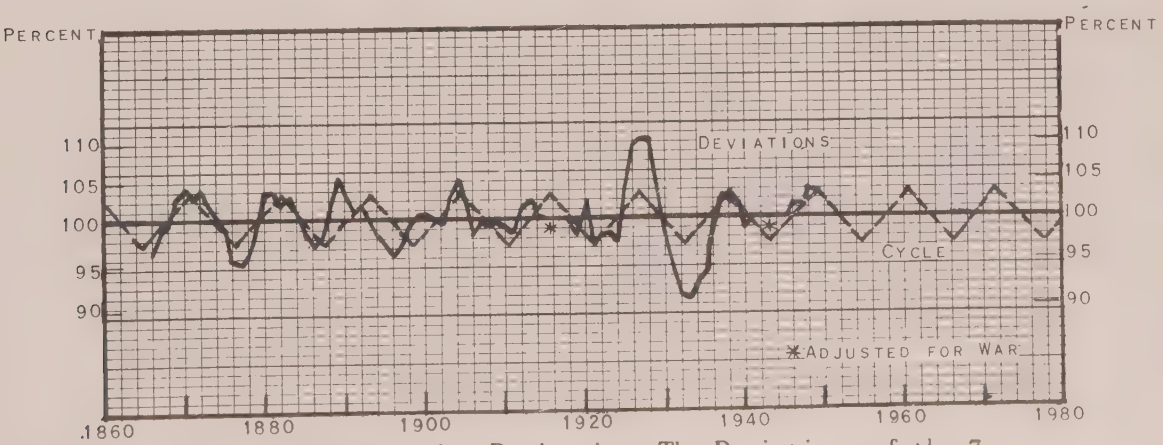


Fig. 5. Manufacturing Production. The Deviations of the 7-Year Moving Average from the 11-Year Moving Average (data adjusted for war) and the Ideal 11.2-Year Cycle. Ratio Scale.

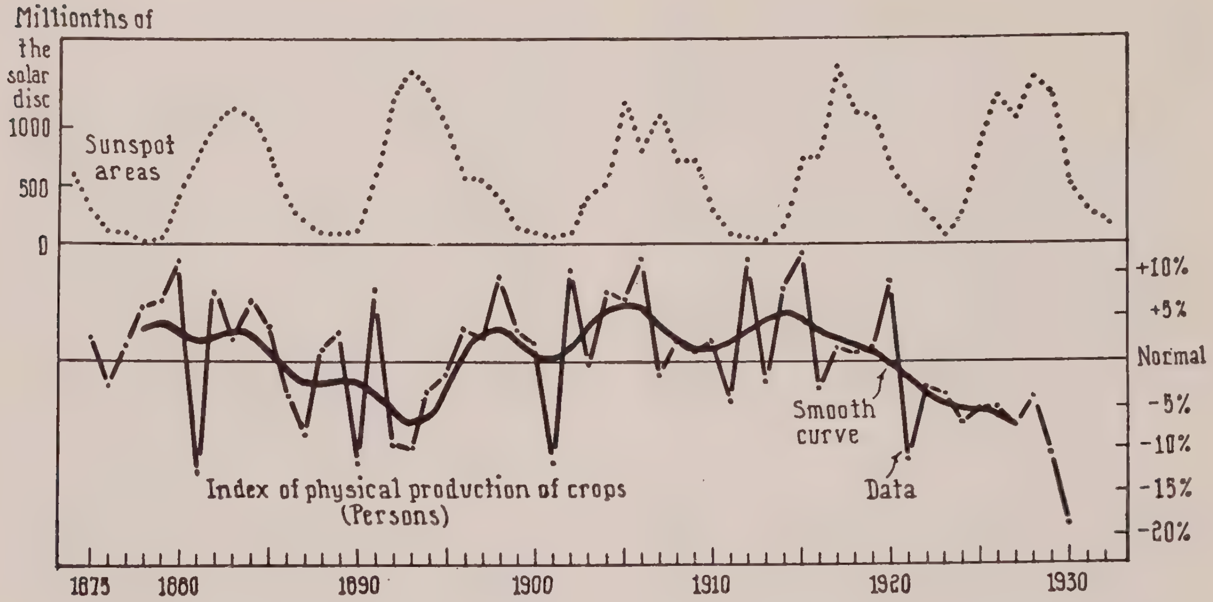


CHART I

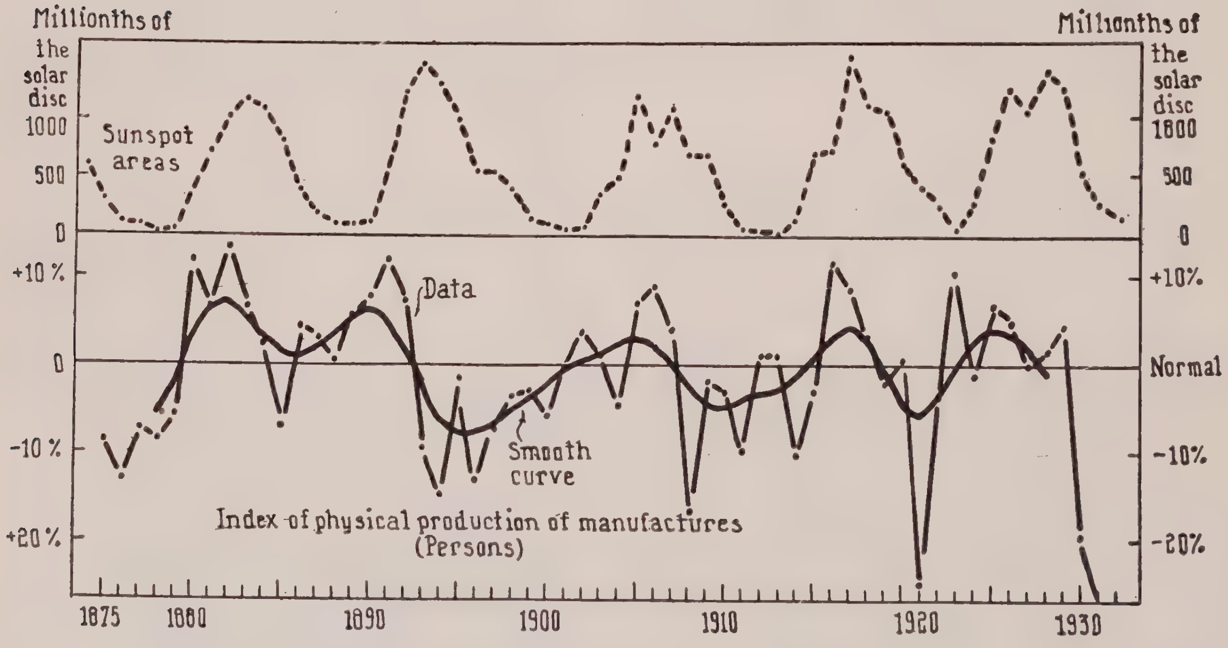


CHART II

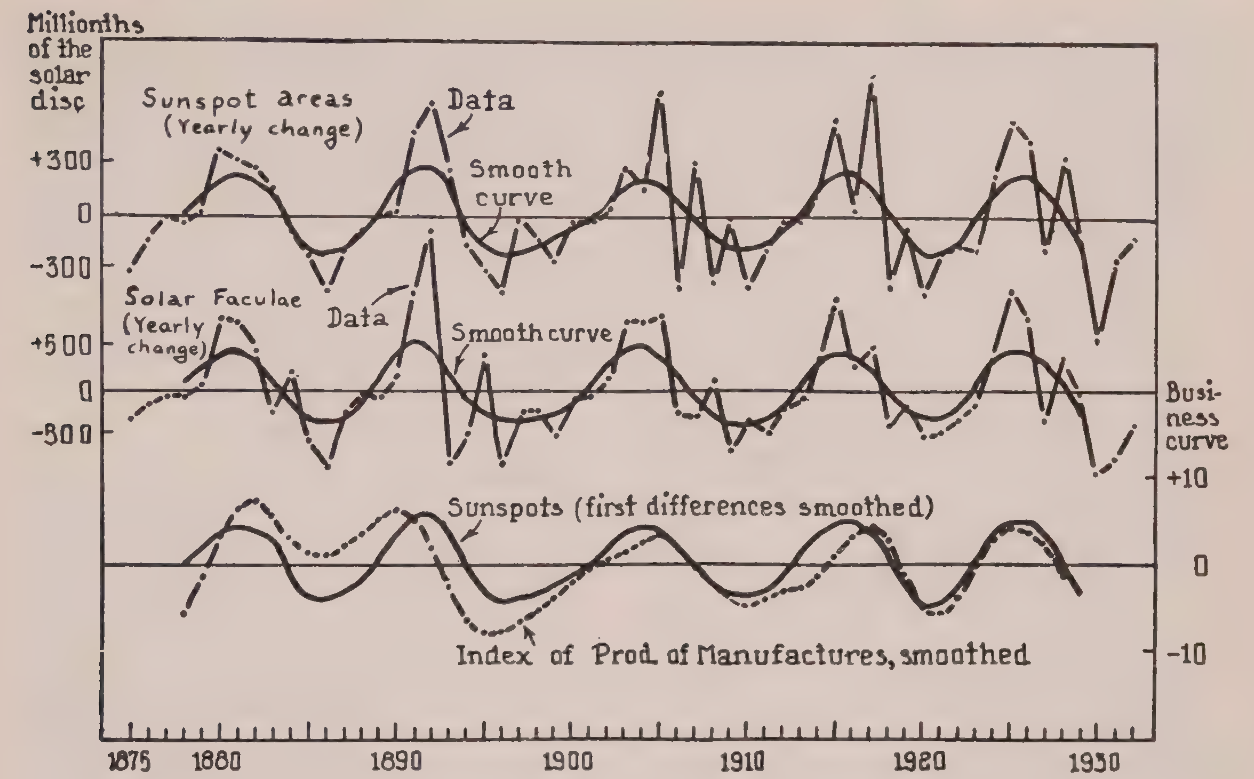


CHART III

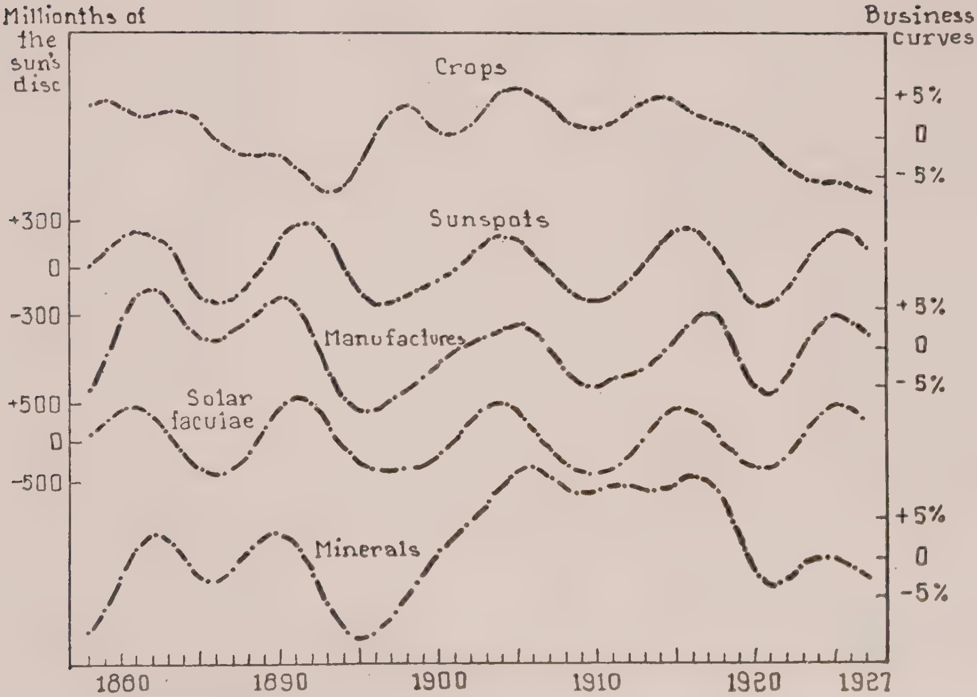


CHART IV

and the smoothed line of the variation of crops appears... clearly..."

But—and this is the striking thing—when Dr. Garcia-Mata compared the curve of sunspot areas with the curve for *manufactures* (with trend eliminated), he found that both curves fluctuated in a cycle about 11.2 years long—the cycle for manufacturing however, turning about three years before the corresponding turn in sunspots. See his Chart II.

As a result of several clues which I shall not go into here, Dr. Garcia-Mata was led to compare manufacturing production with the *rate of change* of sunspot numbers and solar faculae or bright spots as in his Chart III. As you can see, the comparison is quite dramatic.

(Rate of change in this instance means the increase or decrease of the value for each year compared to the value of the year before. Mathematicians often call these numbers the *first differences.*)

The entire story is summarized for you by Dr. Mata in his Chart V. This chart shows a definite correspondence between the cycles of manufactures and minerals and the cycles of rate of change of sunspots and solar faculae—and no correspondence with the cycles of crops.

Does this mean then that manufacturing production is alternately accelerated and retarded by solar activity? Can we blame sunspots for our depressions? I do not think so because the variations in the length of the sunspot cycle are not reflected in similar variations in the length of the manufacturing cycle. It is true that the sunspot cycle and Dr. Garcia-Mata's manufacturing production cycles seem to be of identical length, and that this fact suggests the possiblity of an interrelationship, but it does not prove, or even suggest a *cause and effect* relationship. I prefer to believe that *both* the sun *and* manufacturing (and other earthly phenomena, as you will see in later reports) are affected by a third "something," the nature of which at the present time can only be guessed at.

Jevons' "Crises"

There is still one other matter to be disposed of. If there were 14 "crises" between 1721 and 1867 at average intervals of 10.43 years apart, and if manufacturing production 1863 to date shows an 11.2-year cycle, it is obvious that the pieces do not fit together.

Either (a) "crises" have a different cycle length from manufactures, or (b) the length of the cycle has changed slightly, or (c) Jevons included 1 crisis too many (if he had picked *13* crises his length would have been 11.2 years).

Other Cycles Must be Found

When a few more short term cycles in this series of figures have been isolated, it will be possible to combine them and project them to throw what light we can on the probable extent, depth, and timing of the next depression.

E.R.D.

How it Came Out

THE 6-YEAR CYCLE IN PROCTOR & GAMBLE SALES

BACK in 1949, using figures 1913 to 1948 inclusive, I isolated a 6-year cycle in the gross dollar sales of the Proctor and Gamble Company (see my report of December 1950). How has this cycle in these figures worked out since that time?

Actual sales of P & G, 1913—1948 are shown by means of a thin solid line in Fig. 1 on the next page. Behavior 1948—1952, since the previous work was done, is shown by a heavy solid line. The broken line in Fig. 1 charts a 6-year moving average trend.

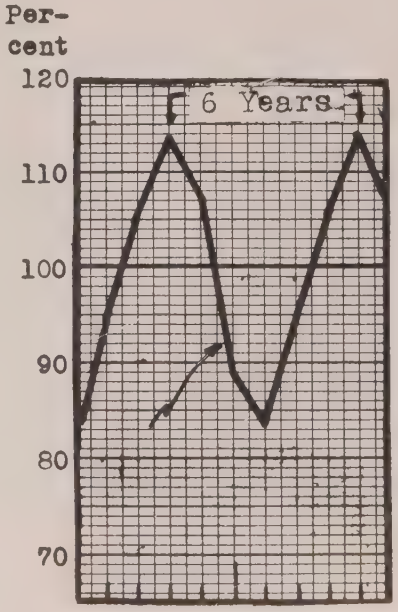
Fig. 2 shows sales expressed as percentages of trend. The thin solid line 1916—1945 shows the values as originally computed. The broken line shows the typical six year cycle. The heavy line, 1945—1949 shows how the cycle has unfolded for four additional years. It is obvious that the trough due in 1946 came on time, that the crest due in 1949 came one year early.

Unfortunately, as a 6-year moving average trend always has to lag three years behind, we cannot know exactly how this cycle has been unfolding since 1949.

If this cycle in these figures is continuing it is in upward phase at the present time, due to reach its peak in the general neighborhood of 1955. Thereafter it is due to decline for three years to a trough in the general neighborhood of 1958.

The typical cycle, based on the five waves isolated in 1949 is shown below. Crests come in 1919 and every 6 years thereafter. Troughs come mid-way between crests. The average wave has an amplitude of about 13 1/2% of trend at crest, 16 1/2% of trend at trough. This adds up to a wave of 30% of trend in 3 years—a very important fluctuation indeed.

E.R.D.



Average Wave Based on 5 Cycles

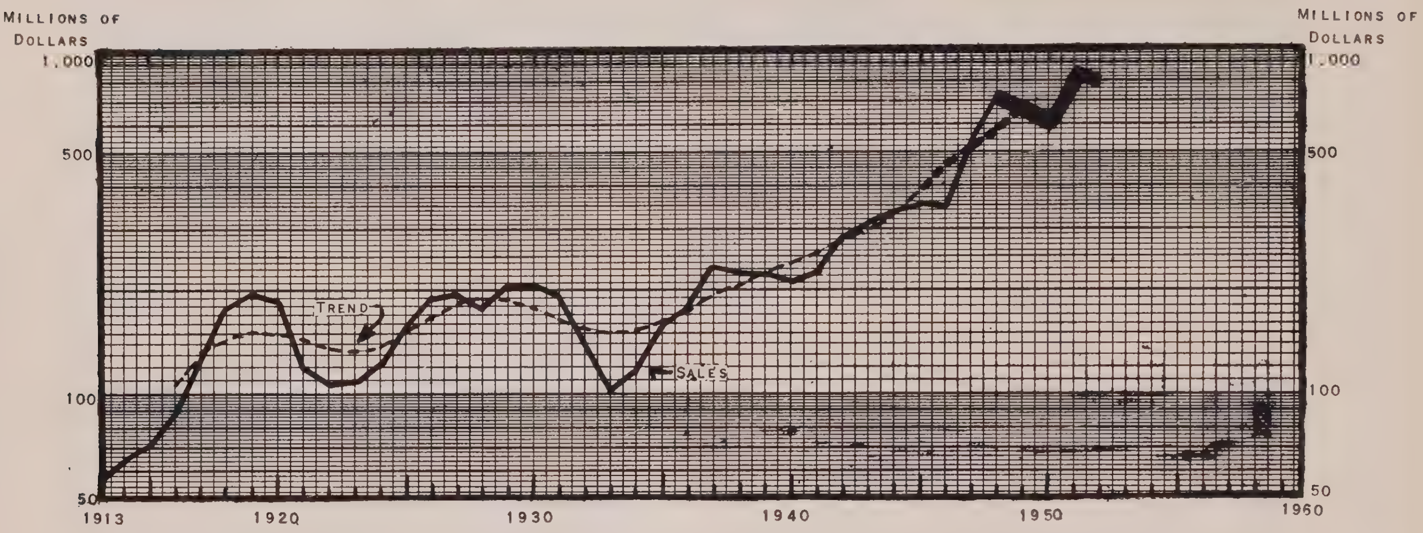


Fig. 1. Proctor & Gamble Sales—Yearly Sales and 6-Year Moving Average Trend. (Data added since original work with heavy line)

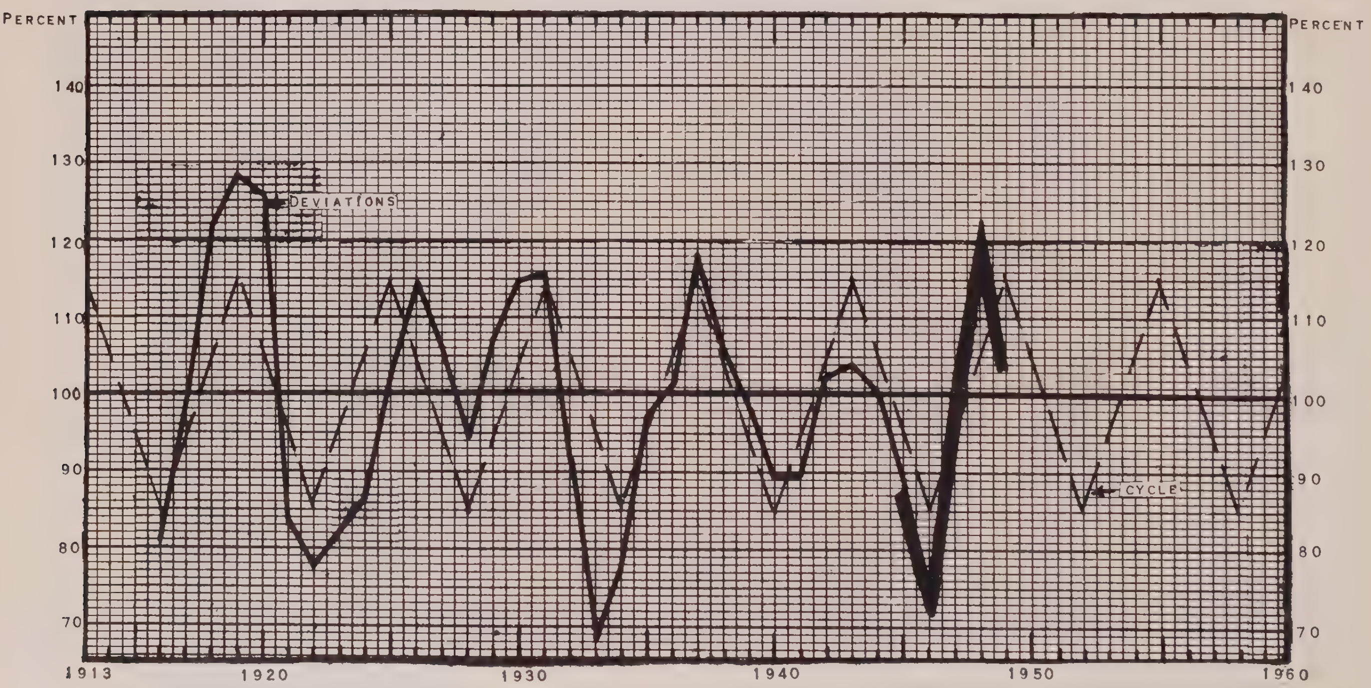


Fig. 2. Proctor & Gamble Sales—Deviations from Trend and the Ideal 6-Year Cycle. (Data added since original work with heavy line)

Foundation Affairs

THE SCIENTIFIC PROGRAM

WE were organized (a) to foster, (b) to promote, and (c) to conduct research in respect to rhythmic cycles. What are our activities and plans in these various directions?

The study of cycles is a job for many heads and many hands. It calls for workers in many fields of natural and social science.

It is our experience that many of the scientists interested in cycle study lack the necessary statistical knowledge and know-how to make effective and fruitful cycle analyses.

Full Time Fellowships

We have therefore established a number of Full-Time Fellowships so that qualified workers in any field of natural or social science can come to Foundation research headquarters for a year or more of intensive study of cycles in their chosen field.

It is intended to limit these fellowships to persons of standing in the scientific world who have already contributed to the fund of knowledge in respect to cycles. The thought is that these persons, after a year or more of study, could return to their respective institutions better equipped to carry on work of significance during the years to come. Especially it is hoped that they might stimulate the younger men working under them to productivity in this field.

It is obvious that the Foundation would also be enriched by contact with minds of the sort described above.

As the students will need clerical assistance for routine computation, once they have mastered the various techniques, and as they themselves are probably earning, or able to earn, from $6,000 to $10,000 a year at their respective institutions, it is obvious that the fellowships will usually cost at least $5,000 a year.

If you would like to finance one of these fellowships please get in touch with me.

Summer Fellowships

Many professors could not easily get leave of absence for a full year. We have therefore established a number of Summer Fellowships. As these fellowships involve only travel, sustenance, and a small amount of clerical assistance, they will usually run from $400 to $800 apiece.

If a regular full time fellowship is larger than you care to finance, perhaps you would like to give money for a Summer Fellowship.

College Library Program

We have been giving free subscriptions to the *Journal of Cycle Research* to college libraries here and abroad. About 600 libraries (490 domestic and 113 foreign) have agreed to display the *Journal*, index it, and add it to their permanent collection. Funds for this purpose will be exhausted with the distribution of the next *Journal*.

Just because of the way colleges are organized it is extremely difficult to get paid subscriptions from them. The subject of cycles cuts across the various department lines. The astronomy department will not ask for the purchase of the *Journal* because it carries only one article every year or two on astronomical subjects. The economics department will not ask for the purchase because the *Journal* has so much material in the field of biology, and so on. Nevertheless, after one more year of free distributions I think we should try to convert at least the American college libraries to a paid subscription basis.

To prepare, print, and distribute 24-page *Journals* four times a year to 600 libraries would cost $1,672 for 1954.

If you want this program to go on, and if you have the necessary money, your gift in the indicated amount would be very welcome.

We could of course send the *Journal* to fewer libraries. This would save some money, but not very much. The first copy of the *Journal*, prepared, printed, and distributed (four issues) costs $1,336 per year. It costs only $56. per year to print and distribute additional hundreds. To cut the program in half would therefore save but $168. a year. If the distribution is to be made at all, it might as well be made right, for the relatively few extra dollars involved.

The Scientific Membership

The core of the Foundation is its scientific membership. This privelege is limited to persons who have published scientific papers in regard to cycles. There are about 250 scientific members at the present time.

We could easily expand this number to 1,500, but it would take some digging to get the names and some correspondence to enroll them. I suppose it would cost all of $1,000 to get a full enrollment. This expenditure hardly seems worth while unless we are prepared to do something with the names when we get them.

Scientific members pay no dues. They have been getting the monthly reports and journals without charge. Money for this purpose is now exhausted. To send the *Journal* to the scientists would cost $168 a year more than to send it to the libraries, but lacking funds for the library program, sending the Journal to the scientists alone would cost $1,504.

The *extra* cost of sending monthly reports to the 250 scientist members is $425 a year, but the reports will not carry the weight that the Journal would.

Ordinarily I do not believe in giving things away, but our case seems to be a little different. We are trying to *create* a science of cycles through the instrumentality of men who think of themselves as (and who primarily are), biologists geologists, climatologists, economists, etc. These men must be educated to the fact that they are also cycle scientists. Until they have attained this concept of themselves they may read about cycle work in other fields, but they certainly will not pay for it.

The Publication of Research

I suppose the fellowship program is the more important, but the program that lies closest to my heart is the publication of the results of the research which is now being carried on.

In order to fill the *Monthly Reports* we do an enormous amount of research. Twenty years from now who will know anything about it? You may keep your back copies, but when you die it is not likely that your heirs will—and even if they do, how would scientists wishing to study the subject know that Mrs. George Tittlemouse of 18 Glenbrook Lane, Wassehoken, has some old magazines of grandpa's that would be helpful?

The *Monthly Report* does go to a few libraries, and, if we had the money, could be sent to many more. However, as it is a semi-popular publication, libraries will throw it out a few years from now for lack of space.

The *Journal*, on the other hand, being a scientific publication, stands a fair chance of being saved. Moreover, if saved, it would be available when and where needed. Finally, the material in the *Journal* is in the form in which the scientist can use it. In the *Monthly Report* it is not. What appears as one page in the *Report* might take seven or eight pages in the *Journal*, to make it of scientific value.

We have enough research *completed* to make each issue of the *Journal* 200 pages long, if only we had the money to prepare it for publication and print it. It seems a shame to do so much work merely for the fun of doing it. I would like to leave something behind for others to build on.

E.R.D.

Questions & Answers

Question:

How much mathematics will be necessary to understand your forthcoming textbook of cycle analysis?

Answer:

It is designed for anyone with a high school education who has a good working knowledge of arithmetic. No mathematics in addition to arithmetic are necessary.

Question:

How can a knowledge of cycles forecast the price of wheat, for example, when so much depends upon government controls?

Answer:

A knowledge of cycles gives you only *part* of the answer. It cannot forecast government action, except as government itself responds to natural cyclic tendencies.

Question:

Would you buy and sell stocks on the basis of the PREDIX forecast?

Answer:

Not at the present time. I feel it should be given time to demonstrate itself first. But I feel it is honestly and openly put together, and that it deserves respectful and serious attention.

Question:

When will your proposed textbook of cycle analysis be available?

Answer:

It is something over half finished. I am pushing it as fast as I can.

Question:

Who makes the best chart paper?

Answer:

At Foundation Headquarters we use the chart paper made by the Codex Book Company of Norwood, Massachusetts.

Question:

Why don't you tell us in plain language just what the stock market is going to do?

Answer:

First, because I do not know; second, because it would not be appropriate for the Foundation to conduct a stockmarket forecasting service; and third, because if I did know, I could easily sell the information as a personal venture for $5,000 a year per client, and five clients at $5,000 a year would give me the $25,000 a year the Foundation needs in order to operate.

Question:

When are you next coming west to talk to the members?

Answer:

When the members who want such a trip will volunteer to make the necessary arrangements. So far, only three persons out of 3,000 have offered to help.

Question:

Couldn't a book comparable to Darwin's *Origin of Species* be written about cycles?

Answer:

I should think so, definitely, if anybody knew enough to write it.

Letters

A Letter from J. H. Nelson

Dear Mr. Dewey:

Thank you for the interesting letter from Monsieur Duchatel, Pessac, France relative to my last report to you on 4 element 60° multiples in planetary spacings and the associated behavior of our Ionosphere and shortwave radio signals.

The second 4 element 60° multiple for 1953 came on May 17th with Mercury 180° from Neptune, 60 behind Mars, and 120° behind Pluto which made a 60°, 120°, and 180° angular arrangement connected to Mercury on the same day. This was followed by Venus also making a similar combination on May 19th with Venus 180° from Mars, 60° ahead of Neptune, and 120° ahead of Pluto.

A very severe radio disturbance began on May 15th and ended on May 21st during which the sun was *without spots*. This is similar to the great disturbance that came with the 4 element 60° multiple at the end of January which also came with *no spots on the sun*. Both of these severe disturbances were forecast considerably in advance. The January 27th disturbance was predicted on December 22nd and the May 15th disturbance was predicted on March 19th as officially recorded at RCA Communications, New York.

I continue to find in my past records that this 4 element 60° multiple is very consistent in its behavior regarding radio disturbances...

We are at the present time, August 25th having another severe radio disturbance *with no spots on the sun*. The main planetary arrangement is a 3 element 60° multiple with Mercury 60° behind Pluto and 130° behind Neptune. This storm was predicted officially on July 24th and rated as severe.

Very truly yours,
J. H. Nelson
Propagation Analyst RCAC

New York City, New York

Editor's Note: See also the letter from Mr. Nelson on page 155 of *Cycles—A Monthly Report* for May, 1953.

A Letter from H. W. Clough

Dear Mr Dewey:

In your interesting article on "What's Ahead for Wheat Prices," appears a long-term trend showing a cycle of about 39 years. Your comments...lead me...to call your attention to the climatic factor involved.

Bruckner, in 1890, published his researches on a 35-year cycle in the temperature and rainfall of western Europe, and a few years later concluded from a study of wheat prices for 200 years that high prices occur during or slightly after periods of maximum rainfall.

In a paper published in the Astrophysical Journal, 1905, I stated that wheat prices as far back as 1265 A.D. varied concurrently with the frequencies of severe winters in Europe in a cycle of 36.5-years, a revision of Bruckner's value.

Beveridge, in 1922, Jour. Roy. Stat. Society, gave a periodogram of wheat prices in England from 1500 to 1870, showing a period of considerable amplitude at 35.5 years...

In Bulletin, Am. Meteor. Society, 1939, I published an article, "The Effect of Climatic Changes upon the Price of Wheat", summarizing my earlier researches on the 37-year cycle in wheat prices in England...

In my 1939 paper, I forecast the 37-year minimum of wheat prices as 1940, which was verified, but prices rose rapidly thereafter, due to World War II. Assuming the cycle length at present to be 40 years, the date of the next maximum phase of the wheat price long-term trend will be 1960.

Sincerely yours,
H. W. Clough

Castile, New York

Editor's Note: For many years Mr. Clough was Meteorologist for the U. S. Weather Bureau.

A Letter from a Salesman

Gentlemen:

Being a salesman and therefore very gullible, I was intrigued by your circular which told very little for ten bucks, so I'm enclosing a check for this amount, hoping I'll get something besides a tip on the winner of next year's Kentucky Derby. Having been born of parents in rather moderate circumstances, in my youth I never had the pleasure of a tricycle, to say nothing of a bicycle, so anything with the word cycle in it, makes me think I'm missing something, if I don't have it— another reason for the enclosed check.

Your committee sounds very imposing, but being such important and extremely busy people in their respective fields, I don't see how they can sit down and figure out cycles, so just how do they fit in your picture? You say something about a director of your foundation, but you don't mention his functions or just what your foundation is trying to do. No doubt your first issue will clarify everything.

A little card enclosed in your letter says something about the Science of Prediction appearing in issues beginning June—how about back copies to include these illuminating articles—maybe they predicted this recent drop in the market?

Cordially,
Louis Smith

Brookline, Massachusetts

In Reply I Said:

Dear Mr. Smith:

I was very happy to get your letter of September 16.

Your membership was made retroactive to start with the June report.

We do not attempt to forecast the stock market, but a cycle study made in June 1952 by a Mr. Vedder Hughey of Coral Gables, Florida which we reprinted in our May report did in fact forecast the recent drop. In view of your interest I am sending you a copy of our May 1953 report with my compliments.

You ask about our committee. You are right, for the most part they do not study cycles themselves. However, most of them either have a keen interest in the subject or they give us an informal link with institutions that have done considerable work in this field.

Over a period of time our reports will doubtless clarify your questions about what the Foundation is trying to do and the functions of the Director, but I doubt if this will become entirely clear in the first issue.

The Foundation attempts to act as a clearing house among scientists in some 36 different fields of science who are conducting research in regard to cycles because:

(a) the techniques are the same regardless of the field of science.

(b) cycles of identical wave length in different phenomena suggest possible interrelationships which might otherwise remain undiscovered.

These relationships, *if and when proved*, may help us to learn more about cycles, particularly their cause.

The Director of the Foundation raises the money to keep the enterprise going (we have no endowment), conducts a considerable amount of research to supplement the work done in the various separate scientific fields, writes the monthly report you are now receiving, sharpens pencils, sweeps the office, answers correspondence, smokes a pipe, meets the deficit, and puts the cat out at night. He is currently engaged also in writing a textbook of cycle analysis to help people who are benighted enough to wish to conduct research in this field.

Very cordially yours,

Additions to the Library

"Soil Bacteria and Fertility," by P. H. H. Gray, *Science Progress*, pp. 444-456, 13 pages, 2 charts. Gift of Dr. Alan Gregg.

Mr. Gray shows that there is a daily cycle in the abundance of soil bacteria for the garden plot studied, the count at 4 p.m. being double the count at 8 a.m. He also shows marked day to day changes in the number of bacteria and of amoebae, but he failed to note whether or not such changes are rhythmic.

• • •

"Wideawake Fair Invaded," by James P. Chapin, *Natural History,* Vol. LV, No. 7, September, 1946, 7 pages, 16 pictures, Gift of the author.

In this article Dr. Chapin tells, among other things, of the curious 9-month cycle of egg laying indulged in by the terns on Ascension Island. In a marginal note he says, "At the end of 1949 the average interval was clearly 9.6 months."

Tern—Ascension Island.

• • •

"The Snowshoe Rabbit Enquiry, 1943-46," by Helen Chitty, reprinted from *The Journal of Animal Ecology,* Vol. 17, No. 1, pp. 39-44, May, 1948, 8 pages, 2 tables, 4 charts, references. Gift of the Bureau of Animal Population, Oxford University.

This paper covers the declining phases of the second 9—11-year cycle in numbers since the start of the Snowshoe Rabbit Enquiry, and also the beginning of the recovery phases of a third cycle.

• • •

"Forced Vibrations With Small Resistance, Approximating Resonance" by L. W. Blau, a reprint from *The American Mathematical Monthly,* Vol. XXXV, No. 6, June-July, 1928, 6 pages, 6 figures, Gift of the author.

"An Experimental Investigation of Forced Vibrations" by L. W. Blau, a reprint from the *Journal of the Franklin Institute,* Vol. 206, No. 3, September, 1928, 12 pages, 28 figures. Gift of the author.

Dr. Blau, formerly head of geophysical and production research for the Humble Oil and Refining Company, has, since 1947, been a research consultant located at Houston, Texas.

These two interesting papers discuss the mathematics of forced vibrations and describe some of Dr. Blau's experiments which are in excellent agreement with theory.

EXCERPTS FROM

CYCLES

THE SCIENCE OF PREDICTION

CHAPTER VI

by EDWARD R. DEWEY
Director, Foundation for the Study of Cycles

and EDWIN F. DAKIN
Associate, Foundation for the Study of Cycles

TOGETHER WITH 1953 SUPPLEMENT

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VI

The 54-Year Rhythm

Apparent in many aspects of the economic life of the United States, since recorded statistics have been available to mark it, is a rhythmic cycle of great importance. Its average length seems to be almost exactly 54 years. That makes it longer than the economic lifetime of most individuals. Thus it readily escapes the notice of the community and of the average businessman whose fortunes, none the less, may in many ways reflect it.

It is a rhythm that is shown statistically, and most clearly, in wholesale price swings. Interestingly enough, there has been in modern times no pronounced long-time *trend* in commodity prices — contrary to general belief. The United States, for instance, is old enough as now organized to have experienced three of these 54-year rhythms; during each one, average commodity prices began at a low level, moved (with interruptions) up to a peak, and moved down again (with interruptions) to approximately the level they had sprung from.

Figure 1 shows the average price level charted for the years 1790–1945, with an ideal 54-year rhythm indicated in dotted lines. One thing is immediately clear. Although the three of the four great wartime price peaks shown on this chart fall fairly well in place, the ideal pattern as it stands could not at any time have foretold, in advance, either the *timing* or the *amplitude* of these war peaks. Wars provide a definite distortion. We shall come back to this matter.

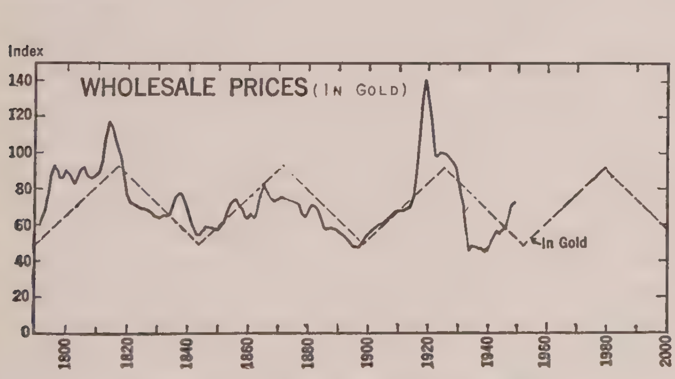

Fig. 1. U. S. Average Wholesale Prices, (In Gold)

Three-year moving average of an index, 1790–1945, 1926 = 100, together with a regular 54-year cycle. The highs of the regular cycle fall in 1817, 1871, 1925, 1979, etc., its lows fall in 1790, 1844, 1898, 1952, 2006, etc. The regular cycle has been extended into the future to indicate approximately what will happen in this series, if the rhythm continues.

Meanwhile, look at Fig. 2, which graphs the price average but omits the wartime peaks, leaving merely a gap where they have been eliminated. The actual price wave (ignoring the gaps) now is clearly more in harmony with the ideal wave. It is obvious here, however, that some other force or forces are present to distort the actual wave so that it is not in perfect conformity with the ideal pattern. We may correctly suspect that other rhythms should be sought. We shall shortly look for them. Meanwhile, we must first make as sure as we can that the 54-year rhythm is real.

In a remarkably comprehensive study that filled seven volumes, *A History of Agriculture and Prices in England,* J. E. T. Rogers assembled invaluable data on wheat prices over several centuries — data which, however approximate, are useful enough for averages and cover the longest range for any price data we have available. Because wheat in its average value is closely associated with the price of commodities in general, it provides us with a rather useful index.

The Rogers wheat-price data, presented in 10-year averages to smooth out annual fluctuations and converted by N. C. Murray to equivalent cents-per-bushel on the basis of equivalent values of gold and silver, are graphed in Fig. 3. (Shown as percentages of a 50-year moving average, they are graphed in Fig. 4. Superimposed in dotted lines is an ideal 54-year pattern.) Several facts are striking. Note, first, that from the early part of the thirteenth century until around 1520, there was no important rising "trend" in prices. Then began a long and almost steady upward sweep that was to last through the next three centuries, as world exploration was begun and brought to fruition, and England developed her colonial system and became a great empire.

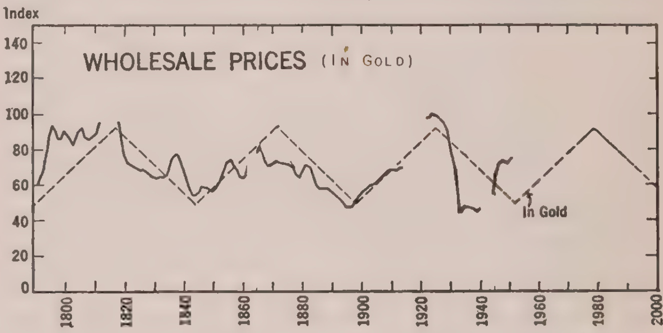

Fig. 2. U. S. Average Wholesale Prices, Excepting War Peaks, (In Gold)

Three-year moving average of index, 1790–1945; omitting periods covering the War of 1812, the Civil War, World War I, and World War II. Conformity to the regular 54-year cycle is more evident with these omissions.

The first part of the rise, from, say, 1520 to 1576, was rather gradual; from 1576 to a crest around 1660, it was meteoric. Then followed about 80 years of mild decline, to a double bottom around 1740. In the next 70 years there was again a great upsweep, which hardly halted in 1790, and then continued its meteoric flight up to an unprecedented peak coinciding with the Napoleonic Wars.

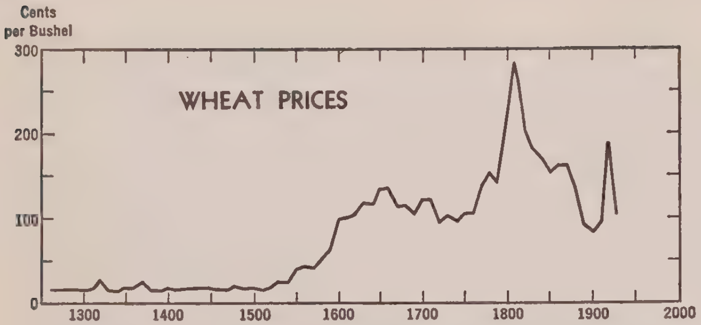

Fig. 3. 680 Years of Wheat Prices in England

Ten-year averages 1260–1940 (after Rogers and Davis). The 54-year rhythm can be discerned, but is obscured by the trend. See Fig. 4 for the same figures, smoothed, with the trend eliminated.

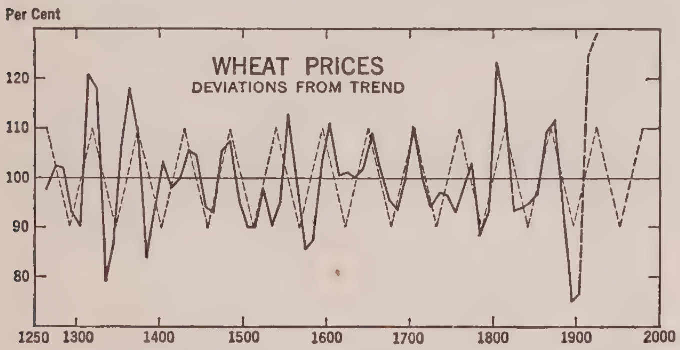

Fig. 4. The 54-Year Rhythm in Wheat Prices in England

To remove the trend, the prices shown in Fig. 3 have been expressed as percentages of their 50-year moving average; the curve has been smoothed by averaging consecutive percentages. A regular 54-year cycle has been added. A rhythm that has repeated itself as many times (13½) and as regularly as this one cannot easily be the result of pure chance.

Then followed almost 100 years of decline. In the period from 1845 there was a brief recovery; then decline continued from the war peak to a bottom around 1898–1900. This bottom, reached almost a century after the peak, was lower than any previous level since the late 1500's. The recovery that set in thereafter with 1900, and continued up through World War I, was almost canceled out by the 1930's.

Approximate as the figures on which these averages are based must be, they still furnish us with evidence of a 50–60-year wave in price movements extending well back into history. It becomes immediately apparent if we correct for the trend described above, and then chart the remainder as in Fig. 4. The rhythm, when studied more carefully, proves to have an average length of very close to 54 years.

One of the difficult pieces of work in the history of periodogram analysis was accomplished by Sir William H. Beveridge, to determine whether or not there were permanent cycles in wheat prices in Eastern and Western Europe. In view of the fact that England was for centuries a free-trade country, its wheat prices could be expected to run in consonance with those of the Continent. Sir William used index numbers so constructed that the upward leap in prices during the transition from medieval to modern times was removed, subjecting them to harmonic analysis over a range of approximately 300 years. He found several true periods that gave strong evidence of correlation with known weather rhythms and sunspot phenomena. And at $T = 54.00$ years (which is without such correlation) he also found a relatively significant concentration of energy.

This 54-year wave as we have experienced it in the United States registers itself in commodity price charts rather clearly. The first wave, from low to low, dates itself 1790–1844; the second runs 1844–1898; and the third, in which the United States has experienced two world wars, falls between a low in 1898 and, if the rhythm continues, one around 1952.*

Because of the incidence of three great wars in American history, each of which occurred around the peak of the ideal 54-year wave and coincided roughly with a peak in commodity prices, some observers have called this 54-year rhythm a recurrent "war cycle." Harold T. Davis has gone so far as to suggest that the average interval of about 50 years between conflicts in the Punic Wars of Rome and Carthage might lend force to such a theory, and points out that those wars undoubtedly created in ancient times a degree of inflation in commodity prices such as has attended our modern war periods.

However interesting that thought may be as historical speculation, of more importance to us is a fact which can be ascertained on our patterns by simple observation: in the United States prices have always risen through the upward sweep of the 54-year wave to a major peak, and they have always fallen during its downward turn to a major bottom. Further, as we may observe in the European price patterns, the European prices always tended to make a recovery around the peak of the 54-year wave, even if they were steadily falling in a long-term price trend; and practically always they have tended to halt their rise, even during a steadily rising long-term price trend, when the 54-year wave reached a trough.

Since 1925 the course of the 54-year rhythm in the United States has been generally downward, reaching toward a trough due, as said above, in 1952 (see Fig. 1). It is significant that — despite the recurrence of war in the 1940's — average retail and wholesale price levels in this country up to mid-1946 did not reach anywhere near the peak of 1919–1920, even though food prices as a group did rise to 1920 levels, as shown in indices like the Dun and Bradstreet index of thirty-one foodstuffs.

We shall learn, when we study the lesser 9-year rhythm which also affects prices, that another rhythmic force was present after 1941 to carry prices upward to moderate degrees. But as a lesser rhythm, it has not served to give prices the enormous rhythmic support they had during the period surrounding World War I, when both the 9-year and 54-year rhythms were moving upward in concert.

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* IT SHOULD BE EMPHASIZED THAT, AS INDICATED ON THE CHARTS ON PAGES 70 AND 71, THIS DISCUSSION AND THIS PROJECTION REFERS TO PRICES IN TERMS OF *gold*. FOR A CHART SHOWING AVERAGE WHOLESALE PRICES ADJUSTED TO A GOLD BASIS REFER TO THE 1953 POSTSCRIPT AT THE END OF THE CHAPTER.

Further interpretation of our price data will come more conveniently in the next section, when the reader meets the 9-year cycle in diagram and can see it combined with the 54-year rhythm.

For the present, having seen some evidence for the statistical reality of this 54-year wave, we shall find it useful to consider some challenging ideas regarding its importance in our organized economy. It was N. D. Kondratieff who first succeeded, through his researches, in impressing many economists with evidence that a long wave of approximately this duration characterized the development of our capitalist economy.[*] Joseph A. Schumpeter, Professor of Economics at Harvard University, approaching the problem from various historical angles, has not only confirmed the major conclusions of Kondratieff, but has gone far to provide the basis for a new understanding of the way our economic organism works.

It should be emphasized, in justice to Professor Schumpeter, that he does not accept the need for exact timing or exact estimates of duration for this rhythm, which he regards as the outcome of new efforts in the society toward progress. For the purpose of his researches, which he reported in the two volumes of his *Business Cycles,* he dates the first long cycle in our modern American history — measured from low to low — from the eighties of the eighteenth century to 1842 — noting that " we have seen reasons to believe that this long wave was not the first of its kind." The following long wave as he saw it ran between 1842 and 1897. And the third is our current one, reaching from 1898 on. Perhaps to avoid implying that he considered the datings completely exact, Professor Schumpeter has called these periods " Kondratieff " cycles, rather than cycles of any specific length.

In his admirable study, which surveyed almost two centuries of economic history in England, Germany, and America, he has shown conclusively that every Kondratieff cycle has been uniquely characterized by some particularly important economic or industrial innovation. The first Kondratieff cycle of the last century was the wave in which we moved forward through the process that has been called the industrial revolution, and the absorption of that revolution's effects. The next Kondratieff was the age of steam and steel — and of railroad development. The Kondratieff that is now drawing to a close has been the age of chemistry, electricity, and motors.

Figure 5, borrowed from Schumpeter's study, answers the reader's natural question as to how far such a wave may be an exclusively American phenomenon. Here we see traced, in the 9-year moving average of the price indices for the three countries, a correspondence in wave movement that is visible without analysis. As Schumpeter points out:

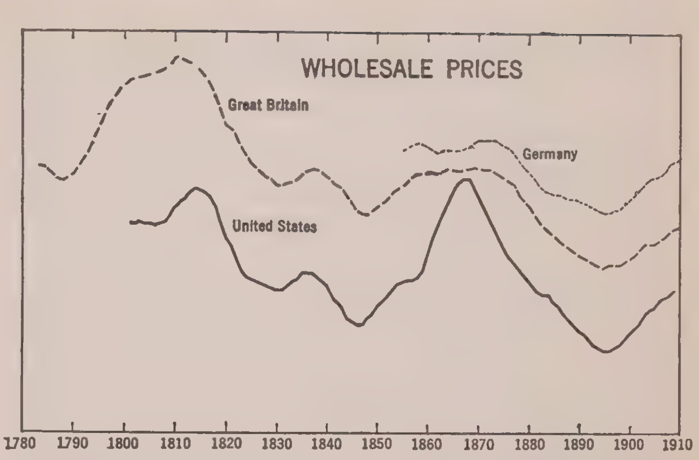

FIG. 5. LONG WAVES IN WORLD WHOLESALE PRICES

Data for Germany, Great Britain, and the United States. Nine-year moving averages of wholesale price indices are plotted on *ratio scale.* (After Schumpeter.)

> Not only do cycles in different countries systematically affect each other, so that the history of hardly any one of them can be written without reference to simultaneous cyclical phases in other countries; but cycles really are, especially as regards the great innovations that produce the Kondratieffs, international phenomena. That is to say, such a process as the railroadization or the electrification of the world transcends the boundaries of individual countries in such a way as to be more truly described as one world-wide process than as the sum of distinct national ones.[*]

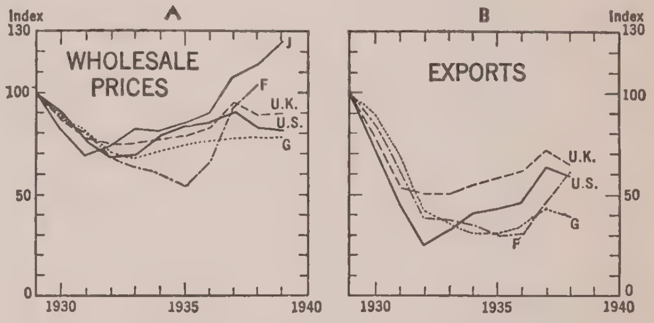

FIG. 6. WORLD INTERRELATIONSHIPS: PRICES AND EXPORTS

A. Indices of wholesale prices, 1929 = 100; B. Indices of total exports, 1929 = 100. (After Davis.)

Davis makes the same point about the unity that prevails in our economic atmosphere:

> Was it accidental, for example, that the unrelated inflations of the South Sea Bubble in England and the Mississippi Bubble in France should have developed concurrently and should have collapsed almost within the same month? [1720] And was it a strange coincidence that the collapse of the American securities market in October 1929 should have been accomplished without appreciable lag in the decline of prices and the commerce of all the other nations in the world?[†]

Davis also shows the two charts which are reproduced in Fig. 6 to illustrate price levels for Germany, France, the United Kingdom, the United States, and Japan in the decade from 1930 to 1940, together with exports for four of the five nations; and he says:

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[*] A translation of Kondratieff's paper will appear as a supplement to the December report.

[*] *Business Cycles* (p. 666), McGraw-Hill Book Co., Inc., 1939.

[†] *The Analysis of Economic Time Series,* p. 558.

> The astonishing thing to be observed in these figures is that wholesale prices and total exports for all countries follow the same pattern. Could this have been occasioned by the collapse of the American stock market, or is it evidence of something which was the cause, among other things, of the American deflation itself? *

We might ask, even more pointedly, why the recoveries shown after the decline should show such parallels in a group of nations as diverse as these countries in the economic *mechanisms* they had prevailing after 1933. In that year, for instance, the New Deal began in the United States and Hitler took over in Germany. The United States began promoting reciprocal trade treaties, and Germany tried her hand at forced exports, backed by subsidies and the Schacht invention of several different kinds of marks. Britain moved toward preferential tariffs within the Empire, and France moved toward the Blum concepts of socialism. With all such divergencies of mechanism, the nations concerned went through the era with a consistent and continued similarity in economic outcomes.

Even more to the point, the various nations, through all their depressions and ensuing political disturbances and recoveries of the 1930's, displayed in their economies the rhythmic patterns that one could have anticipated from observing their past patterns of response. Says Professor Schumpeter concerning the world-wide depression itself: " We not only know that all the essential features of the post-war period up to the world crisis, but also those of the world crisis itself, answer perfectly to expectation from our model, i.e., past experience." † Of the ensuing economic recovery, he said, after tracing its outcome in England: " Neither new policies nor the numerous disturbances to which England's economy was exposed, effaced the cyclical contour lines which, taking account of specifically English conditions, we should expect from our scheme." ‡ As to Germany's burst of activity after 1933, he underlines the fact that in a government-managed economy the rhythms of the previous capitalist economy are still perpetuated, by saying: " This is exactly the kind of performance our model would have led us to expect from unfettered capitalism. Very obviously, however, capitalism was not unfettered."** Of the rise in American prosperity that was attributed after 1933 to the measures of the New Deal — but which arrived strictly as might have been anticipated by anyone projecting the familiar economic waves of the past — Schumpeter declares shortly: " It would be contrary to all experience and common sense, though of course no logical impossibility, that a process which can be strictly proved to have been running its course since at least the sixteenth century and right to the end of 1932, should have come to a stop suddenly on March 4, 1933." ‡

We shall not labor this point here, noting it chiefly as a matter of background information. Thousands of words could be written in the conventional attempt to trace all the workings of unlike causes which produced such like effects, and in the end no one would be much wiser. For our purposes it is sufficient to note a similarity in the patterns of the phenomena that prevail over such a wide geographic area; those patterns are very closely related, beyond doubt.

While the major rhythms we are dealing with seem to prevail more or less universally throughout the world's industrialized economies, some show up more prominently in one nation, others more markedly elsewhere. It is as if different organisms responded with different degrees of receptivity to stimuli in the environment. We shall find this particularly true when we note later how even different industries and different products may be more responsive to one particular rhythm than to another.

Thus we need not find it unusual if the 54-year rhythm usually shows up in one nation in wider swings, more clearly marked, than in other nations. The 9-year rhythm, which we are shortly to meet, appears more clearly in Germany and America than in England. There is also a 41-month rhythm which similarly stands out more clearly in America than in Europe. On the other hand, there is a rhythm of around 5½ years in the Continental economies which shows up there almost as clearly as the 41-month rhythm in the United States. Here we do find a rhythm of 5½ years in corn and cotton prices, in security prices, and in a number of other series of industrial importance; but with us the 41-month rhythm tends to overshadow it.

Thus far we have spoken of the 54-year wave primarily as a *price* phenomenon. And indeed, because it has registered itself so clearly in prices, the charting of those prices is the clearest and simplest way of recognizing the phenomenon historically, and tracing it.

But to understand what we are really tracing, let us remember that prices are always only symbols. The 54-year price wave can only emanate from a 54-year wave in human activity, and it is doubtless this activity which is *the* basic reality.

In the beginning of the wave's upward sweep, as Professor Schumpeter and others see it, the economy is poised for expansion. The economy is just ending a time of depression when, as in winter, few things grew. Storms have stripped down the decayed trees and weak limbs that could not stand the testing of tempests. In such an economy many debts have been wiped out and others greatly reduced; excesses of many sorts have been paid for; surpluses have been largely distributed; people finally begin to sense in the air a kind of burgeoning opportunity, like the faint smell of spring when there is no change yet visible to the eye.

That was the air in our own nation, for instance, around 1790; around 1845; around 1898. It is a time when venture capital starts coming forth — when industries that got started in a small way toward the autumn of the last cycle now begin to find growing opportunities — when even the most casual scatterings of seed may spring up into a lush growth. It is in this early phase of the cycle, as Schumpeter demonstrated, that the innovations which characterize each new cycle of this kind begin to spring up in full force.

* *Ibid.*

† *Business Cycles*, p. 984.

‡ *Ibid.*, p. 966.

** *Ibid.*, p. 972.

‡ *Ibid.*, p. 985.

Just as the railroad was on the scene in primitive form before 1845, but waited until afterward for its real development — just as electricity came into being before 1898, but became a great economic force only in the 1900's — the great industrial innovations that rise in such a springtime were usually planted in the previous cycle. Their really great and characterizing work — a work that is to end in transforming the economic scene — begins in this new spring, as the new industries rise to majestic adult proportions.

A multifarious number of other contributary industries rise simultaneously, some great, some small; and as they thrive, so do older industries that dot the scene. Employment grows; money starts flowing; credit expands. When midsummer has arrived, when the peak of the growing cycle is reached, there seem a million evidences around of a new era, a florid age of growth beyond the memory of living man. Speculation regarding the boundless future is rife. That was 1929, in our own memory.

But now the summer storm gathers; suddenly from nowhere clouds appear, the barometer suddenly falls, and in the quick hail and rains and winds there is a scurrying in from the fields. When the sun comes out again, the humidity is drained from the air, and in its clear light there is already a hint of autumn. That was, say, 1880, and our own 1933.

This late summer and coming autumn is the period of the great harvest — when the products of industry usually are distributed more widely than ever before. Prices have come down from their peak. And, though they will form occasional tables, they now usually continue to drift generally downward — while wages, on the whole, stay up. This means growing purchasing power for the workers who have jobs. It makes a special kind of proletarian prosperity, where the benefits of the economy are now even more widely shared than in the days when industrial expansion was so rapid.

There is, unfortunately, more unemployment. For, as prices decline, manufacturers naturally look for ways to eliminate extra man-hours, to turn out their product for less. And competition grows among the manufacturers. Newcomers spring up, attracted by the records of lush profits made by those now long in the field. Combinations between manufacturers, sometimes only in the form of silent working agreements, come along naturally, as those most exposed to competition try to protect themselves. And some of these combinations may hang over into the next era — as they did to plague the first Roosevelt — and give him political opportunity.

People begin to try to hold on to what they have. Some of the old enterprise has lost its fervor. There are bursts of speculation and business expansion now and then — we shall see that these come along at fairly regular 9-year intervals, somehow. But the great progress of the era has now been made. As it slowly draws to an end, people look backward to the past midsummer days when great fortunes could sometimes be found almost by turning over a stone, if you were lucky; and jobs were everywhere; and unprecedented industrial and economic achievements were transforming the landscape. And the people begin to wonder if progress has really stopped. Such was the mood in the nineties, for instance, when Bryan was touring the country to tell rapt audiences the nation must not be crucified on the cross of gold. We may see it come again as the mood of the late forties or early fifties.

This, in very general terms, is the outline of the 54-year rhythm in the economy as it has been outlined by Professor Schumpeter and other observers. Each cycle starts out anew — not where the previous one began, but where the previous one ended. Each leaves the environment vastly different from its state a half century before. The record of the rhythm that appears in the price charts is only a very skeletonized record, but it is at least a record useful for statistical purposes.

Care is needed in interpreting and using the record, just because it is such a skeleton. In viewing the autumn period characterized by price declines, for instance, we must not assume that the declining prices necessarily mean business depression. Under certain conditions, our economy actually works better and smoother when prices are slowly receding. It has been pointed out, a thousand times over, that our chief economic security lies in distributing the output of consumers' goods ever more widely. A slowly falling price level *may* be the sign of such an accomplishment. Such facts serve to warn us that a strong upward sweep in the long-term price chart is not necessarily to be translated as prosperity; and a downward sweep certainly does not necessarily mean depression.

If our 54-year rhythm, which shows up so clearly in the long-term chart of wholesale prices, does not of itself signify times of prosperity and stability and depression, then what does it do? It acts, in effect, as a clock. In association with three other rhythms we are to observe shortly, it gives us a way to know what time it is in our economy.

Suppose a young man has some capital and is going to start a business. Because he is too young to have much personal memory of the great economic tides in the world, and because school education is usually so deficient in such matters, he is like an airplane traveler who travels far around the world without a watch, and then lands in a fog. What time of day is it? How much time has he before evening? Is he sure even of the day of the month? It might be the beginning of a new week, or it might be the end of an old one — depending on the international date line, and where he is in reference to it. Unless he knows, or can quickly find out, he may manage himself very badly.

Anyone who starts out in business without knowing what time it is on the economic clock will obviously owe much to luck if he succeeds. And many men who have engaged successfully in business for a long time owe much to their sheer good fortune in having started out when the economic sun was rising.

In the middle 1950's the great 54-year rhythm should be rising again, if the past rhythmic patterns repeat themselves. Unless past precedent fails, we may look forward to that economic time as farmers look forward to spring after a long winter — a spring when seeds long quiet in the ground should be shooting up almost miraculously, with a new spirit of enterprise revealing itself everywhere.

Just as the millions saw electricity and the motor completely transform our environment and ways of living following 1898, those who live into the third quarter of our century may well see the growth of new forces just as dramatic, impelling, and universal in their effect — forces of which atomic energy may be only one.

The start of a new *trend* in our economy cannot be forecast, as we have seen. But even without expecting any lift in the trend lines, this new long-term cycle could be read in advance to provide hope for a coming long-term era of prosperity and progress in our nation, regardless of any depression that may intervene.

Footnote: In the chapter on the 54-year rhythm as originally printed, there were a number of additional charts taken from Kondratieff's paper showing long waves in other economic phenomena. As a translation of Kondratieff's paper is to be reprinted as a supplement to our December report, and as all these charts will be reprinted with it, it seems best not to reproduce them here also.

1953 Postscript To Chapter VI

In the ten years that have elapsed since the foregoing chapter was written a number of things about the 54-year cycle have been learned that were not known—at least to Mr. Dakin or to me—at the end of 1943.

Moreover, correspondence with numerous people shows that a number of the things we *did* know ten years ago were not made sufficiently plain in this chapter as originally written.

Let me start this 1953 Postscript by mentioning the new things I have learned.

First. Some work done in 1949 on cycles in tree ring widths of Arizona pines for the period 1100 A.D. to 1909 shows a cycle of about 54 years in length present on the average in each third of this 810 year period.

Second. Investigation of all available early figures of production in the United States shows that the 54-year cycle is present in most if not all of these series for as far back as the figures go. But—and this is most important—the timing of the 54-year cycle in production figures is very different from the timing of this cycle in *prices*, as discussed in the foregoing chapter.

Third. I have discovered a reference made in 1878 by W. S. Jevons to a 50-year cycle in economics, discovered in 1847 by a Dr. Clarke. Clarke's work thus antedates Kondratieff's work by 79 years. Apparently the so-called "Kondratieff" cycle should be called the "Clarke" cycle, if we are to name cycles after their discoverers.

Fourth. My attention has been called to the fact that the 54-year cycle in British wheat prices has been caused at least in part by successive devaluations of the currency occuring, at least in the early years, at intervals which average from 50 to 60 years apart. The rhythm is no less real on this account, but the origin if the variation is worth noting.

Fifth. I have learned that a cycle of 52 years was one of the cornerstones of the Aztec culture. If the 52-year cycle of the Aztecs can be assumed to be the same as the 50—60-year cycle of Kondratieff, this discovery provides a wider base for this cycle than had previously been imagined.

In this connection the 60-year "Golden Cycles" into which the ancient Chinese divided time may be worth mentioning.

The five items listed above are facts not known to me when the foregoing chapter was written. Let us now consider four ways in which the chapter was not sufficiently clear.

First. It was not made sufficiently clear that Professor Schumpeter's interesting and provocative conjectures were not necessarily the views of Mr. Dakin and myself. Schumpeter's colorful observations may have been a stroke of intuitive genius and may indeed be the way in which the 54-year cycle unfolds. But the records do not go back far enough to enable us to be sure that the coincidences observed by Schumpeter are more than coincidences.

Second. It was not made sufficiently clear that the 54-year cycle is merely a *tendency*. The actual crests and troughs of the 54-year cycle may come considerably in advance or considerably after ideal timing.

Third. The chapter failed to emphasize—or even to mention, except in two of the charts—that the prices being referred to were prices in terms of gold. If a crooked government dilutes your money by adding 50% "water" you have a distortion that must be adjusted for, just as you would have to adjust a nutrition chart for the milk of a crooked milkman. If you had a crooked milkman you might have to get two quarts of his product to provide the nourishment you would get from one quart of real milk. It is the same with money.

Fourth. It was not made sufficiently clear that, statistically at least, the foregoing chapter was dealing largely with the 54-year cycle in *prices*--average wholesale prices in the United States, wheat prices in England. People have assumed that if the 54-year cycle is present in prices it "ought" to be present in all sorts of other things as well. Moreover, they have assumed that in their other phenomena the 54-year cycle "ought" to have crests and troughs at the same time as the crests and troughs in prices. Some of Kondratieff's charts suggest this, too, and certain people even closer home have made the same mistake.

The 54-year cycle does, in fact, seem to be present in other phenomena, just as it "ought" to be. But in other things, particularly production, it has very different timing, from its timing in prices as discussed in Chapter VI.

Let me now elaborate some of these points:

The 54-Year Cycle in Tree Rings

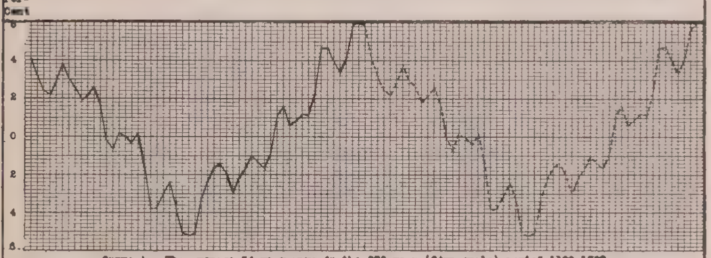
As you doubtless know, trees grow by adding successive annual layers of wood. When the tree is cut these layers show as rings because the hard dense winter growth differs in appearance from the softer more porous summer growth. Some of these annual rings are wide, some are narrow. There is a tendency for the wide and narrow rings to alternate at rhythmic time intervals.

Fig. 7, printed below, shows the results of some research done in 1949 with measurements of tree ring widths in the Lukachukai district of Arizona. Curve A shows the average 54-year wave in the 270 year period 1100—1369; Curve B shows the average 54-year wave in the period 1370—1639; and Curve C shows the average 54-year wave in the 270 year period 1640—1909. The slight wobble in timing suggests the concurrent presence of a cycle about 60 years in length.

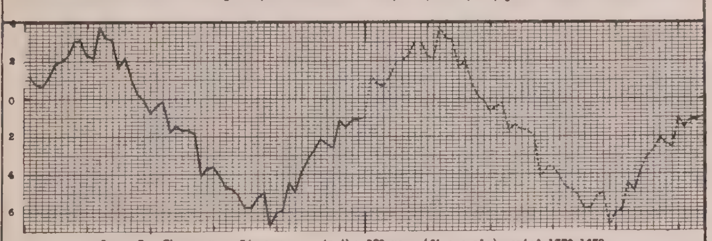
FIG. 7

THE AVERAGE 54-YEAR WAVE IN TREE RING WIDTHS IN THE LUKACHUKAI DISTRICT, ARIZONA, FOR EACH OF THE THREE 270-YEAR PERIODS 1100-1369, 1370-1639, AND 1640-1909.

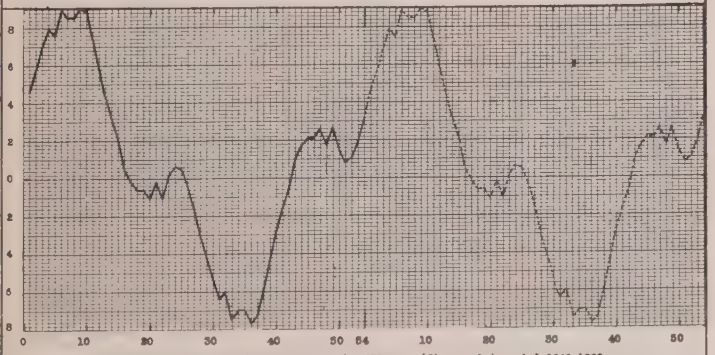
The charts show for each period the 27-year moving average of the average median of the percentages that the actual widths are of their uncentered three-decade moving averages, repeated in phantom to aid the eye.



Curve A. The average 54-year wave in the 270-year (five cycle) period 1100-1369.



Curve B. The average 54-year wave in the 270-year (five cycle) period 1370-1639.



Curve C. The average 54-year wave in the 270-year (five cycle) period 1640-1909.

The work has not yet been done to make sure that the 54-year cycle in tree rings repeats rhythmically, but, as far as it has gone, the research tends to substantiate the reality of a 54-year cycle in nature.

The 54-Year Cycle in Production

To me, at least, the chart showing the 54-year cycle in British wheat prices from 1260 to 1950 is convincing. This chart is printed on page 72 of the chapter on the 54-year cycle. The 54-year cycle in this chart is convincing because we have *13 repetitions of the 54-year wave.*

To be as sure of the existence of a 54-year cycle in production we would have to find the cycle in equal dominance and equal regularity over an equal number of repetitions. This is impossible as far as the United States is concerned for records here do not go back more than about three 54-year waves.

Now in spite of the old saying, "Once an accident, twice a coincidence, three times a habit," three times is *not* a habit. Three waves in succession can occur easily as a result of random forces. Three successive waves, unless supported by other evidence, do not prove anything—except that there have been three waves of this length. Three waves by themselves do not prove, or even suggest, that the behavior will necessarily continue. We can find a 54-year cycle in United States production figures easily enough, as it is there, but we can have confidence in its *significance* only by inference.

What really needs to be done is to study production figures of other countries, where records go back much farther than in the United States. I am told that records of certain Swedish lumber companies, for example, go back for 700 or 800 years. Doubtless many other long series of figures exist. So far I have not had access to such records. The necessary studies have, therefore, not been made.

Confining ourselves to figures in the United States, the 54-year cycle in production does, indeed, seem to be present throughout recorded history. Of course, three waves would not be enough to go on by themselves, but when we find these three 54-year waves supported by the six 54-year waves of Sir William Beveridge's work with British wheat prices, and by the thirteen 54-year waves of my own work on those figures, we may be justified in giving provisional acceptance to the concept of a 54-year cycle in production. However, whereas the 54-year cycle in prices seems to crest ideally about 1925, the 54-year cycle in production seems to crest about 1906, nineteen years earlier.

This conclusion is based on a study of early figures of ship building, cotton consumption, lumber production, pig iron production, and other indicies of physical production in the United States.

If this is the true state of affairs we have a partial explanation for the exceptional severity of the depression of the 1930's, for the peculiar shape of so many growth curves, and for the mighty upsurging of production during recent years.

If the crest of the 54-year cycle in *production* came around 1906, and the 54-year cycle is significant and continues, we would expect more or less similar behavior at 54-year intervals forward from that time. For the future this suggests that, starting in the 1960's, as the 54-year cycle starts to decline, many trend lines may again seem to flatten. It also suggests that such falling off of production and consequent depression as may come in the general neighborhood of 1990 may be of unusual severity.

The Half-Century Aztec Cycle

To describe the corresponding cycle of the Aztec culture—if in truth it *is* a corresponding cycle—I cannot do better than to quote from a letter recently received from a correspondent in San Jose, California. Excerpts from his letter follow:

Kondratieff contended that the phenomena of the 50- to 60-year recurring cycles, had its cause essentially and fundamently in the capitalistic system. Silberling brings out the fact that:

"We have here an interpretation of this wave phenomena that is very probably associated with a Russian view of the mechanics of capitalism and that attributes to the dynamics of capitalism most of the things that happen in the world, including the making of wars and revolutions and the promotion of new colonial areas."

Siberling goes on to prove his point, very effectively, I think, that the phenomena is associated with causes of world wide and historic scope, regardless of the form of political and social organization.

It is certainly true, as you say in *Cycles*, referring to Harold T. Davis' attempt to find indication of the cycle in the ancient recurrent Punic wars of Rome and Carthage, that:

"However interesting the thought may be as historical speculation, of more importance to us is the fact which can be ascertained on our patterns by simple observation:"

Yet, nevertheless, it is certainly also true, that any historical manifestations of the phenomena tend to establish it as "the response of organisms (that is, genus Homo-sapiens in particular) to stimuli in the environment," and will enhance the value of the theory and greatly increase the confidence with which it is accepted.

All the references which I have been able to uncover so far deal with the discovery of the cycle by Kondratieff—with possibly some slight shadows cast before by others as is usually the case in scientific discoveries—and attempts to identify its manifestations in the classical lineage of Western civilization—that is, the Greek-Roman-European trend. The discovery of a rhythmic recurrent cycle, of approximately the same period as the Kondratieff, in an entirely unrelated civilization would furnish independent proof of the latters universal application.

Such a cycle does appear in the ancient Aztec civilization of Mexico, in such a positive manner that it is hardly possible that it has escaped the notice of scholars.

Last summer, while traveling in Mexico, a guide called to my attention the ancient Aztec calendar stone—remarkable for many things, but to me particularly, because of its chronology. In our civilization the longest interval for measuring time is the century, consisting of 100 years, fashioned after material and practical considerations—the time cycle is divorced from any reaction of the organism to the environment, save a rational one which effectively hides any phenomena of the nature of the Kondratieff.

The Aztec calendar was divided into intervals of 52 years—a striking coincidence in itself. But this interval served not only to measure their longest interval of time, but constituted in a most positive manner a recurrent emotional cycle influencing every phase of Aztec life and thinking. The great historian William H. Prescott, in setting down the Aztec mythology, states:

"The Aztec felt the curiosity, common to man in almost every stage of civilization, to lift the veil which covers the mysterious past, and the more awful future. They sought relief like the nations of the Old Continent, from the oppressive idea of eternity, by breaking it up into distinct cycles, or periods of time, each of several thousand years' duration. There were four of these cycles—etc. . . ."

The calendar reckons time from the year 1091 A.D. soon after their settlement in the new country. Can anyone doubt but that the elapse of 52 years represents a cycle beginning with all the boldness and foresight of a people reaching a "promised land," reaching a climax after some 26 years and descending to a nadir of pessimism 26 years later. In describing the formation of this calendar Prescott says: "They threw the years into great cycles of 52 each. . ." and goes on to conclude his description of Aztec chronology as follows:

"I shall conclude the account of Mexican science, with that of a remarkable festival, celebrated by the natives at the termination of the great cycle of 52 years. We have seen, in the preceding chapter, their tradition of the destruction of the world at four successive epochs. They looked forward confidently to another such catastrophe, to take place, like the preceding, at the close of a cycle, when the sun was to be effaced from the heavens, the human race, from the earth, and when the darkness of chaos was to settle on the habitable globe."

As the end of the cycle approached Prescott—in *The Conquest of Mexico*—goes on to describe the depths of despair reached by the Aztecs as the end of the 52-year cycle approached:—

"They broke in pieces the little images of their household Gods, in whom they no longer trusted. The holy fires were suffered to go out in the temples, and none were lighted in their own dwellings. Their furniture and domestic utensils were destroyed; their garments torn in pieces; and everything was thrown into disorder, for the coming of the evil genii who were to descend on the desolate earth."

Prescott goes on to describe the sacrificial rites and ceremonies undertaken to appease the Gods and avert the impending catastrophe. He further goes on to describe the elation of the people and the return of vigor when, as they believed, the Gods had answered their prayers, ending as follows:

"As the light streamed up to heaven," (the light of the ceremonial fires), "shouts of joy and triumph burst forth from the countless multitude who covered the hills, the terraces of the temples, and the house-tops, with eyes anxiously bent on the mount of sacrifice. Couriers, with torches lighted at the blazing becon, rapidly bore them over every part of the country; and the cheering element was seen brightening on altar and hearth-stone, for the circuit of many a league, long before the sun, rising on his accustomed track, gave assurance that a new cycle had commenced its march, and that the laws of nature were not to be reversed. . ."

A new Kondratieff had begun.

So much for the additional knowledge which has come to light during the last ten years in regard to the 54-year cycle.

Let me now expand briefly two or three of the ways in which Chapter VI, as originally written, was not sufficiently clear. The distinction between the 54-year cycle in prices, as described in Chapter VI, and the 54-year cycle in production, which in 1943 had not yet been investigated, has been commented upon above. It remains to comment upon the regularity of the 54-year cycle and the fact that the 54-year cycle in prices, which Mr. Dakin and I wrote about, was a 54-year cycle in terms of gold prices.

The Regularity of the 54-Year Cycle in Prices

If you will take the time to study Fig. 4 on page 72, showing British wheat prices from 1260 A.D. to 1940 A.D., you will see that the peaks and the troughs of the 54-year cycle in these figures are usually early or late, and often by considerable amounts. That is what you would expect. If the turning-points had come as regularly as clockwork, it would not have taken 700 years for men to observe the fact that this tendency exists. The crests and troughs of economic cycles do **not** come with precise regularity. In fact, if you study Fig. 4 carefully you will see that a number of the turning-points came as much as 15 years, or a quarter of a cycle, one way or the other from perfect timing. Moreover, as explained in the caption, the points in Fig. 4 represent 20-year averages. The actual turning-point in the *annual* figures might have been even farther than 15 years from perfect timing. Surely no one should expect a cycle to dominate in the future with any more precision than it has in the past.

For the hundred fifty years charted, the 54-year cycle in average wholesale prices in the United States shows much greater regularity. But there is no reason to suppose that, if average wholesale prices in this country went back to 1260, they would be more regular than British wheat prices, or that future wholesale prices here would show any greater regularity either.

As far as the 54-year cycle *by itself* can tell us, one can merely say that the *probabilities* are that British wheat prices, and presumably average wholesale prices in the United States as well, will have a *low* 10 or 15 years one way or the other from 1952, that they will have a *high* 10 or 15 years one way or the other from 1979 (27 years later), that they will have another *low* 10 or 15 years one way or the other from 2006, etc. In exceptional cases the actual highs or lows might be even further from perfection, especially when you have distortion due to war or inflation.

All of this should have been spelled out letter by letter when the chapter on the 54-year cycle was written 10 years ago. But it was all so clearly self-evident from the charts of British wheat prices that it seemed ponderous and laborious to do so.

The 54-Year Cycle in Prices—in Terms of Gold

Except insofar as inflation caused by debasing the currency tends to come at rhythmic time intervals, it is an abnormal situation which must be taken into account, just as you would take into account distortion caused by war or any other sporadic event.

There are many ways of taking into account and adjusting for the distortions caused by watered money—none of them entirely accurate or entirely satisfactory. One way of making the adjustment is to divide prices by the number of the debased paper dollars which you carry around in your pocket which are required in the black market to buy a gold dollar. This method has two disadvantages—the illegality of the transaction and the numismatic value of the gold coins both probably have some effect upon the black market price. However, as these elements of the situation should not change much from year to year, these possibilities do not seem to invalidate for cycle study the method of adjustment suggested.

In Table 1 you will find a record of the number of paper dollars required to buy a gold dollar according to *Pick's World Currency Report* of 75 West Street, New York, New York. This firm is a research organization specializing in statistical information on black, gray, and white market prices of currency and precious metals.

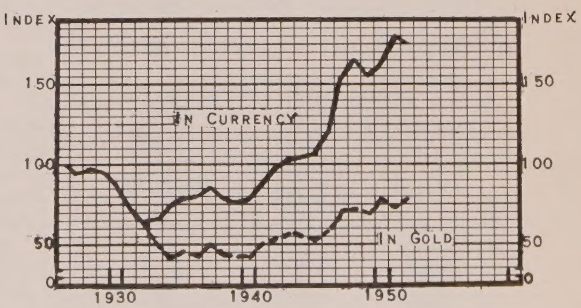


Fig. 8. Index of Wholesale Prices
in the United States 1926 = 100.

Table 2 shows average wholesale prices, 1926--1952, adjusted to a gold basis by this method. Fig. 8 charts average wholesale prices in the United States from 1920 through 1952 on both a gold and a debased currency basis. It is obvious that in terms of gold, as measured this way, prices are less than half of what they are in terms of paper.

It is also obvious that whether the cause be war or something else, the 54-year cycle is already in upward phase.

TABLE 1

Black Market Prices of 1/20 Double Eagles, in U. S. Paper Dollars, by Years, 1932—1952.

Year	Price
1932	$1.00
1933	1.31
1934	1.80
1935	1.74
1936	1.72
1937	1.73
1938	1.79
1939	1.81
1940	1.86
1941	1.73
1942	1.81
1943	1.81
1944	1.91
1945	2.03
1946	2.08
1947	2.16
1948	2.28
1949	2.24
1950	2.06
1951	2.47
1952	2.25

TABLE 2

Index of Average Wholesale Prices in the United States, 1926—1952, in Currency and in Gold, 1926 = 100.

TABLE 2 (continued)

Year	Index in Currency	Index in Gold
1926	100.0	100.0
1927	95.4	95.4
1928	96.7	96.7
1929	95.3	95.3
1930	86.4	86.4
1931	73.0	73.0
1932	64.8	64.8
1933	65.9	50.5
1934	74.9	41.6
1935	80.0	46.0
1936	80.8	41.9
1937	86.3	50.0
1938	78.6	43.5
1939	77.1	42.7
1940	78.6	42.4
1941	87.3	50.4
1942	98.8	54.4
1943	103.1	57.1
1944	104.0	54.4
1945	105.8	52.1
1946	121.1	58.1
1947	152.1	70.3
1948	165.0	72.4
1949	155.0	69.3
1950	161.7	78.6
1951	180.4	73.0
1952	175.5	78.0

Summary

In the ten years that have elapsed since *Cycles* was written, I have learned a good deal more about the 54-year cycle, all of it tending to substantiate the reality and the significance of this cycle in human affairs.

More particularly I have learned (a) that a cycle of about this length seems to have been present in tree rings over the past 800 years, (b) that a cycle of about this length was recognized as a natural time division by the Aztec culture, and (c) that such a cycle has been present in physical production in the United States in all the aspects of physical production for which long term series of figures are available. In physical production, however, in those instances where I have been able to time it, the 54-year cycle crests ideally about 1910, 1965, etc. and troughs ideally about 1935, 1990, and so on. This fact suggests that after the 1960's many trend lines may again flatten, as from 1910 to 1935, and that any depression which comes in the 20-year period centering on 1990 may be unusually severe.

I have also come to realize that this chapter was not entirely plain to a number of readers. More particularly (a) Mr. Dakin and I should have disassociated ourselves a little more from Professor Schumpeter's colorful conjectures, not because they are wrong, but because we cannot yet be certain that they are right, (b) we should have more strongly stressed the fact that the crests and troughs of this cycle—like all other cycles—are usually early or usually late—the given cycle length is merely an ideal to which actual behavior approximates, and (c) in discussing prices we should have emphasized that we were referring to prices in terms of gold.

E.R.D.

GLOSSARY

Cycle, coming from a Greek word meaning circle, implies coming around to the place of beginning. Strictly speaking, in the word itself there is no necessary implication of regularity, but the word is often used loosely to denote rhythm or periodicity.

When the word cycle is modified by a time interval such as 6-year cycle, 20-month cycle, 17-day cycle, the phrase usually means a cycle that recurs with reasonable regularity. In other words, it denotes rhythm.

Rhythm, coming from a Greek word meaning measured time, implies a beat, or a tendency toward perfect regularity or periodicity. It is what we really mean on most of the occasions when we use the word cycle.

Cycle analysis, as we are using the term in this bulletin, should really be called rhythm analysis, as we are concerned with **rhythmic cycles**--cycles that recur with a beat.

Periodicity, in the strict sense, is the quality of being regularly recurrent. It is a quality not often found in nature. The ideal cycles which are often added to a chart to diagram a rhythmic cycle are true periodicities.

A **wave** is one single cycle or undulation. Waves have **frequency**, **amplitude**, **period**, and, at least when they represent harmonic curves, **phase**.

Frequency is the number of complete vibrations to and fro--i.e. waves--per second It is a term not used by cycle analysts when dealing with cycles that are over a second in length.

Amplitude is the extent of a vibratory movement measured from the average position to an extreme position; that is, it is the height or depth of the wave above or below the axis around which the wave oscillates.

Positive amplitude is the distance above the axis, **negative amplitude** is the distance below the axis, **overall amplitude** is the sum of the positive and negative amplitudes. Amplitudes may be expressed in absolute units or as a percentage of the value of the axis.

Period is the interval of time required for a periodic motion to complete a cycle and begin to repeat itself. It is the length of the wave from crest to crest or trough to trough or from some other point on the curve taken as the **epoch**. The **epoch** is the point on the curve chosen as the beginning of the wave. In physics and astronomy it is usually taken as the point where the curve crosses the axis on its upward motion, but it may be any other point as well.

Phase, in a simple harmonic curve, is the point or stage in the period to which the oscillation has advanced considered in relation to a standard position or assumed instant of starting. It is measured along the axis, usually in degrees. By extension of meaning, **positive phase** is therefore the part of the wave above the axis or trend, and **negative phase** is the part of the wave below the axis or trend. When the crests (or troughs) of two or more different series of waves come at the same time, the waves are said to be **in phase** with each other. When the crests of one series of waves coincide with the troughs of another series, the series are spoken of as in **reverse phase**.

A **simple harmonic curve** referred to once or twice above, is the curve you would get by tracing the motion of a pendulum upon a piece of smoked paper that was moving at uniform speed at right angles to the direction in which the pendulum was swaying back and forth. It is perfectly simple, regular, and symmetrical and, in mathematical study, is usually referred to as a **sine curve**. A single oscillation is called a **sine wave**.

A **rectilinear** or **saw-tooth wave**, on the other hand, is a wave the sides of which are straight lines; in other words, zigzag.

Trend is the tendency of data in a series to increase or decrease during a long period of time. The expression, "a long period of time," cannot be defined except relatively. If you are dealing with hourly figures, you might consider trend as the general direction over the past 30 or 40 hours. With yearly figures "trend" might mean the general tendency over the past 100 years or more.

An **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½. An average of this sort is more accurately called the **arithmetic mean**.

An arrangement of numbers is called a **series**.

When the numbers with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of cotton for each of four consecutive years, or represent the number of accidents on each of four consecutive days, you would call the numbers by this name—a time series.

You could still average the numbers and say, for example, that the average price for all four years was 11½ cents, or that during the period there was an average of 11½ accidents per day, as the case might be.

You could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (22 + 11 + 13 (36) divided by 3).

A **moving average** is a succession of averages secured from a series of numbers by dropping the first number (item) in each group averaged and including the next number in the series after the group, thus obtaining the next group to be averaged, and so on.

Thus, when you averaged the first three numbers of our time series (10, 12, and 11) and got 11, and then dropped the first number (10) and added the fourth number (13) and averaged again and got 12, you were constructing a moving average

Because you were averaging three items at a time, you would call the result a 3-item or 3-term moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily values,, you would call the result a 3-day moving average.

The **moving total** is the series of successive totals from which the moving average is computed. For example: When , above, you added 10, 12, and 11 to get 33, and then added 12, 11, and 13 to get 36 (as a step in the task of getting 11 and 12, the two terms of the moving average), you were computing a moving total.

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